ARCHIVES OF OTOLOGY.

CASE OF PURULENT MENINGITIS IN WHICH PURULENT DISEASE OF THE MIDDLE EAR INVADED THE INTERIOR OF THE CRANIUM THROUGH THE LABYRINTHINE CAVITIES AND FALLOPIAN CANAL.[1]

By Dr. JAS. FINLAYSON, Physician to Western Infirmary, Glasgow, and Dr. THOS. BARR, Glasgow.

Dr. Finlayson said the patient was a man twenty-two years of age, a draper by occupation, who was admitted to the Glasgow Western Infirmary on December 18, 1888. He had been subject to a fetid discharge from the right ear since he had measles when four years old, and for a long time he had been in the habit of picking his ear with pins. Five weeks before admission, after picking his ear, it became unusually painful, and a considerable discharge of blood and matter occurred at this time; the lining of the canal also became so much swollen that the ear could not be examined at that time; the pain extended from the right ear to the occipital region. He was seen at that time by Dr. A. D. Stewart, who treated the ear affection: he seems to have found him markedly feverish; according to the patient, the temperature was 102° F. During the first two weeks of his confinement to bed he was very giddy, but, improving in the third week, he was able to get up, and even to go out in the fourth week. In a few days, however, he became worse, with pains in the jaw and behind the right ear; he thought these pains were aggravated on eating. This was on December 10th; by the 12th the pains on the right side of the face were much worse, but these ceased on the 13th, although the pains in the head itself then became more severe. He began to vomit on the 14th, and this continued till the 16th December. He was said by his sister to have had a bad shivering on the 14th. He was admitted on the 18th to the Western Infirmary.

On admission he complained much of pain in the head, both in

[1] Brought before the Glasgow Pathological and Clinical Society on 11th March, 1889, when sections of temporal bone were shown by Dr. Barr.

the frontal and the occipital region, and also of pain in the back, especially in the sacral region, and this portion of the spine was very tender on pressure ; his head was much retracted, so that he lay with difficulty on his back, and when he did so his eyes nearly looked to the wall at the head of his bed. The pain in the back prevented him from sitting up in bed ; it was found that he could turn round on to his elbow, and even towards his face : in these movements his back seemed to move as a whole. He could, however, sit on the edge of the bed ; while seated thus the knee-jerk was found to be almost or entirely absent. He was found to be able to stand and walk a step or two with assistance. His temperature was high (102°–103° F.) ; pulse about 90 ; respiration, 36. Tongue furred and dry. Intelligence very good, his answers being clear and precise.

On admission, Dr. Finlayson said the patient presented most of the typical symptoms of cerebro-spinal meningitis, but there were no eruptions or blotches of any kind on the skin. The presence of a chronic ear disease on the side affected with the severe pains, and the clear history of a recent exacerbation of the aural condition, made it almost certain that the acute illness was connected with these facts. Moreover, a slight, but perfectly distinct, paralysis of the facial nerve on the right side, apparently of five weeks' duration, pointed in the same direction. This affection of the facial nerve was the only distinct paralysis detected. Dr. Barr's examination of the ear showed that while hearing by air-conduction was extremely defective in the right ear, the bone-conduction, as tested both by Weber's and Rinne's test, was in excess. Polypoid excrescencies were also found in the right meatus (which Dr. Barr removed subsequently), but there were no evidences of mastoid irritation. The left ear was practically normal. On examination of the eyes by Dr. Reid, there were signs of papillitis of a mild type in the left ; the right seemed normal, but could not be examined thoroughly. Nothing special was found on examining the chest or abdomen.

After admission the patient continued feverish (102°–103° F.), and in two or three days it was found, that although his headache was apparently less severe, the intelligence was much obscured, although he could sometimes answer sensibly. At times he had marked shaking of the jaw, and also of the right hand while trying to take a drink, but no general rigors occurred. The pupils remained equal and were found to contract readily to light. The

retraction of the head varied, but was distinctly less after the patient became more stupid. The abdomen was not retracted; the so-called *tache cérébrale* was well marked. The catheter had only been used once, viz., on the day he died. The bowels required medicines and enemata. The urine contained no albumen, but a very distinct reaction of sugar was obtained; a quantitative analysis showing, in the specimen examined, 0.25 per cent. of sugar. The confusion of mind deepened into a stupor before death, and the day he died he vomited once, for the first time since admission; hiccough and general tremulousness preceded the terminal coma. The temperature reached 104.2° F. three hours before death. He died on December 24th, about a week after admission, and six weeks after the first onset of the acute symptoms.

In discussing the diagnosis, Dr. Finlayson said that the connection of the meningeal symptoms with the ear disease seemed perfectly plain, although even with this in view the idea of a cerebro-spinal affection was strongly suggested, not only by the extreme retraction of the head, but also by the pain and stiffness of the back. The idea of a cerebellar abscess was likewise discussed, as abscess in this situation occasionally follows upon ear disease, and marked retraction of the head has been observed in such cases. In considering the question of abscess, attention was directed to the region of the jugular veins to ascertain if there were any tenderness there suggestive of thrombosis or inflammation in the region of the lateral sinus, but no such tenderness existed there or behind the insertion of the sterno-mastoid. After an anxious consideration of the case in view of any possible surgical interference, the only definite conclusion open seemed to be that formulated by Dr. Barr, that the symptoms pointed to purulent disease in the posterior fossa, but whether meningeal inflammation of this type or cerebellar abscess seemed doubtful. The symptoms in most respects strongly suggested meningitis; on the other hand, the two periods in the acute illness, separated by a week's interval, during part of which the patient could go about, seemed liker the course of an abscess, and the occurrence of a rigor a few days before admission, with the be-

ginning of the second period of illness, rather pointed in the same direction.

The *post-mortem* examination showed the case to be one of purulent meningitis, apparently occurring in two attacks; unfortunately an examination of the head only was permitted, and so the state of the spinal cord could not be ascertained; a portion of it cut out, as far below the foramen magnum as possible, seemed to show an absence of deposits in the membranes there. There was no thrombosis in the longitudinal sinus, and none in the lateral sinus. The vessels of the pia mater, and especially the veins, were much engorged all over. On the convexity, on the right side, at the edge of the longitudinal fissure at the upper part of the frontal convolutions, a little purulent exudation was found, and a similar but slighter deposit was found on the left side at the posterior part of the frontal convolutions. On removing the brain a considerable amount of fluid was found at the base, and this presented a purulent admixture in the region of the medulla. The brain was found to be adherent near the right internal auditory meatus, and it had to be dissected off the membranes and bone; there was at this spot a piece of necrosed tissue, partly brain substance and partly membrane. This portion was found to be the very anterior extremity of the right lobe of the cerebellum; this destructive process had extended slightly to the side of the pons at its posterior part. The base of the brain presented extensive purulent inflammation. This process seemed to have extended from the spot where the pus oozed out on dissecting off the adhesion, towards the side of the medulla and to the inferior surface of the cerebellum, crossing over to the left side also; the purulent deposit extended about an inch both to the right and left of the middle of the cerebellum, behind the medulla. On the right side of the cerebellum, in this situation, a distinct membrane could be stripped off, leaving inflammatory products still visible on the pia mater; in this membrane, as stripped off, injected vessels could be seen. On dissecting up the medulla oblongata so as to expose the fourth ventricle, some gelatino-purulent exudation was

found in both its anterior and posterior aspect. Considerable inflammatory exudation existed at the optic chiasma. There was no very marked inflammatory deposit on the surface of the temporo-sphenoidal lobes. The cerebellum was not adherent to the cerebrum above. Some adhesion of the anterior lobes to each other was present, with distinct exudation on the inner surface of the right lobe. The fissures of Sylvius were likewise somewhat adherent.

The ventricles were moderately distended. No lesions were found in the brain substance, except the destruction of the small portion of the cerebellum and adjacent part of the pons already described.

The pus which oozed from the internal auditory meatus was very fetid, and there was obvious disease of the petrous bone; this was removed for further examination by Dr. Barr.

Examination of temporal bone by Dr. Barr.—On removing the anterior wall of the external canal of the ear, the greater part of the membrane was seen to be destroyed, only a rim of 2 *mm* in breadth remaining at the lower part. A mass of granulation tissue protruded from the cavity of the tympanum, especially at the upper and back part. On separating the temporal bone into two parts, through the Eustachian tube, tympanic cavity, and mastoid cells, the granulation tissue was seen to spring partly from the antrum mastoideum, but chiefly from the inner wall of the tympanic cavity, especially above and behind. On carefully removing this granulation tissue, Dr. Barr found embedded in it the stapes, quite detached from its fenestra, and the facial nerve quite denuded of its bony casing. At that part therefore where the Fallopian canal courses behind and above the fenestra ovalis, the bony casing of the canal had been completely destroyed, and the nerve lay quite exposed in the cavity of the tympanum. The malleus, partially destroyed by caries, was also embedded in granulative tissue, and lay in contact with the outer wall of the upper tympanic cavity. The incus was absent.

The mastoid cells, with exception of the antrum, were obliterated and converted into hard, dense bone. The an-

trum was, however, dilated, forming a cavity of much larger dimensions than that found in health, lined by thickened mucous membrane and filled with decomposing caseous-looking pus. Only a very thin plate of bone separated this cavity from the middle fossa of the cranium above.

The inner or labyrinthine wall of the tympanum showed the most striking changes. Irregular carious openings were found, communicating with the interiors of the semicircular canals, the vestibule, and the cochlea. The fenestra ovalis was much enlarged by carious erosion; the fenestra rotunda was, however, closed by hyperostosis. On reflecting light into these gaps, a dark aperture was seen at the forepart of the inner wall of the vestibule; this was the situation of the fossa hemispherica, which, instead of being a perforated lamina through which, in the normal condition, the fibres of the vestibular division of the auditory nerve pass, was a simple hole, enlarged by carious erosion; the nerve, much thickened, ended here. At the lower and forepart was seen the entrance to the scala vestibuli of the cochlea, while at the posterior part were seen two openings into semicircular canals.

On removing the roof of the internal auditory canal, the auditory nerve, inseparably united to the facial, was exposed, forming a thick reddish mass. The cribriform lamina was eroded and destroyed by caries, so that no hindrance existed to the passage of purulent matter to the internal auditory meatus. The facial nerve was seen in its windings from the internal auditory canal to the stylomastoid foramen. The first part of its course (the horizontal part), as it passes straight outwards to the geniculate ganglion, was artificially exposed, and here the nerve was seen to be red, enlarged, and somewhat softened. In the second part of its course, where it abruptly turns backwards almost at right angles to the first part, and curves round the fenestra ovalis, it was quite denuded of its bony casing, and was of a reddish color. This part of the nerve was embedded in granulation tissue. The third or vertical part, which was in great part opened into by the chisel, was normal in appearance.

On the upper surface of the petrous part, a very small carious aperture was found communicating with the interior of the cochlea. There was no evidence, however, of its having participated in the extension of the disease to the brain. Over the superior semicircular canal the bone was slightly discolored, softish, and friable. This was easily picked off with forceps, exposing the white, dense, bony capsule of the canal partially opened into.

Remarks by Dr. Barr.—The temporal bone in this case illustrated a rare though not unknown mode by which purulent disease of the middle ear may extend to the intra-cranial cavity, namely, by the labyrinthine cavities and Fallopian canal to the internal auditory meatus. The most frequent directions by which disease of the middle ear invades the interior of the cranium are through the roof of the middle ear to the middle fossa (temporo-sphenoidal lobe), and through the inner wall of the mastoid cells to the posterior fossa (the lateral sinus and cerebellum). The bony partitions, however, in these situations were intact, but the inner or labyrinthine wall of the tympanic cavity and the osseous casing of the facial nerve, as well as the cribriform plate, were broken through by caries.

In regard to the denuded condition of the facial nerve in the tympanic cavity, some may doubt whether this was not a congenital condition. It is well known that small gaps are sometimes found in the bony walls of the Fallopian canal, at that part where it is found so closely related to the tympanic cavity. It is indeed probable that many of the cases of facial paralysis which occur during an inflammation of the middle-ear may be due to the circumstance that a gap exists in the bony casing of the nerve, and that thus the mucous membrane of the middle-ear and the neurilemma of the nerve are in contact. Here, however, I think there is no doubt that the nerve has been laid bare by carious erosion, and although the stem was not destroyed at any part, the pressure of the granulation tissue and of the purulent secretion, as well as the inflammatory process in the nerve itself, would give rise to the facial paralysis.

The state of the bone-conduction was a remarkable feat-

ure of this case. Here the labyrinthine cavities were occupied by pus, and the membranous labyrinth, with the terminal structures of the auditory nerve, were destroyed, and yet perception of sound by bone-conduction still existed, and, what was still more remarkable, the tuning-fork applied to the middle line of the head was heard louder in the affected ear (Weber's test). At the time when this test was employed the patient was quite intelligent, and considering that the result was opposed to what the patient would have expected, there is no reason to doubt the accuracy of his statement. This peculiarity has been met with by other observers, such as by Dr. Jacobson (Berlin), who related to the otological section of the Versammlung Deutscher Naturforscher und Aerzte, in Cologne in 1888, a case in which there was similar destruction of the labyrinthine structures while the tuning-fork on repeated testing was heard almost exclusively on the affected side. Here the test was applied on several occasions, and always with the same result. Such instances rather detract from the importance of this test in diagnosis, and may lead to a modification of opinion as to the value of this method, or as to the nature of the process of bone-conduction.

It is interesting to notice in connection with the presence of sugar in the urine, observed in this case, that Dr. Gairdner recorded, in the *Glasgow Med. Journal* (Oct., 1887), a case in which diabetes mellitus was associated with brain disease and paralysis of the portio dura, which originated in purulent disease of the middle ear.

NECROSIS AND CARIES OF THE TEMPORAL BONE TREATED WITH ACIDS.

By Dr. OLE BULL, of Christiania, Norway.

CARIES and necrosis of the temporal bone is any thing but a rare disease. So far as my experience goes, I have found it the oftener the closer I have made my investigations, and still I think that the cases in which I have overlooked it are quite as numerous as those in which I have been able to state it. The diagnosis is indeed, apart from the well-pronounced cases, quite difficult, and in most instances we must have the patient under observation for a longer time, before we can discriminate the real nature of affection. The most reliable symptom, the grating felt under the probe, is available only when the affected part is accessible to the instrument, and even then (when necrosis and not caries is present), it cannot always be felt. Consequently, the negative result of probing is not of great value. The constant reappearance of granulations in the same place in which they have been destroyed is a symptom which pretty surely proves the presence of dead bone, but this can only lead us to the right diagnosis when the affected part lies in a visible spot. Not seldom the place in which the perforation of the drum is seen may at an early period awake the belief that a mortification of the bone has taken place. It is a well-known fact that the place of predilection to the carious processes is the innermost and upper part of the bony meatus and the adjoining part of the roof of the tympanic cavity. Consequently, when we see a perforation in the drumhead, especially when this perforation has a

crater-like appearance, we shall seldom fail, sooner or later, to find caries of the meatus, or of the roof of the tympanic cavity. The peculiar smell of the discharge is also very suspicious, but not so constant that its absence can constitute negative proof of bone affection. In the majority of cases the surest evidence of necrosis is the persistency of the discharge, in spite of careful and prolonged treatment.

When we have satisfied ourselves of the presence of caries, the indication for removal of the diseased bone is given. How this indication is to be met will, however, be difficult to answer in many, if not in most, cases. The old belief, that by any constitutional treatment we may be able to exercise any curative effect on this affection, must be classified among the legends. The given indication can only be fulfilled by local treatment, either in a mechanical way, viz., operation, or by chemical means. Operation is, from reasons set forth above, for the majority of cases impossible to be carried out. Even when we have been able to find the place of the affected part, we cannot always perform an operation without too great risk to the patient's life. From a theoretical point of view, it will be much safer to use chemical means, viz., acids, by which we can act on the dead bone so as to make it absorbable. Being fluid, the acids are not restricted to the parts accessible to hand and sight; their action need not to be of any injury to the healthy parts surrounding the affected bone. That acids sufficiently diluted can be applied to the surface of the tympanic cavity without causing dangerous inflammatory reaction is proved by Mathewson[1] and Weber-Liel,[2] as regards surphuric acid. Furthermore, Woakes[3] has used a lotion of sulphurous acid of the same strength as given in the Pharm. Brit.

Concerning the effect of sulphuric acid, I cannot speak from personal experience. Since I read the paper of Woakes, I have used sulphurous acid in a great number of cases. I must, however, confess that only in two or three

[1] Transactions of the Amer. Otolog. Soc., '78.
[2] *Monatsschrift für Ohrenheilk.*, '85.
[3] *Ann. des Malad. de l'Oreille*, etc., '84. In the communication of Weber-Liel, and in the last edition of Gruber's Otology, '88, sulphurous acid is incorrectly translated sulphuric acid.

cases I have seen any benefit of it, and even in these it appears to me doubtful whether the good effect was to be attributed to the decalcifying action of the acid or to its antiseptic property. A great inconvenience to this remedy is the pain which it causes when employed for a protracted period, and in a state not too much diluted. The pain has, in fact, often been so intolerable that I have been compelled to desist from using it, and have gone back to milder antiseptics, such as solution of hyperoxide of hydrogen, perchloride of hydrargyrum, etc. By these, combined with a thorough cleansing of the parts, I have sought to prevent self-infection, meanwhile hoping that a happy fate would save my patients from all the other sad results to which carious or necrotic processes of the temporal bone too often lead. Although this "laisser aller" treatment was any thing but gratifying, I went on with it till, in the summer of '87, I got a case of caries in which the circumstances were such as to call for a remedy, whereby the sequestrum could be removed in a gentle manner, without resorting to operation. So I took the question for decalcifying the dead bone under renewed consideration.

The power of an acid to dissolve the earthy substances of the bone depends on its chemical combination, and on the solubility of the new-formed salts. Beyond this, its power to act on the organic substances of bone must be taken into consideration. Not knowing how the different acids would act, I commenced to make a series of experiments with different acids of different concentration, in order to find out which of them in the shortest time could decalcify bones of a certain size. I took plates of compact bone, (shavings of bone used in playing at cards), cut them up in squares of the same size, and tried with the following acids: Ac. hydrochloricum, nitricum, phosphoricum, sulphuricum, and sulphurosum. Of the last I took a solution corresponding in strength to that of the Pharm. Brit., containing about 9 per cent. volume gas in distilled water. The other four I have used in solutions of 1, 2, 3, and 4 per cent. The quantity of the solution, as well as the size of the squares, has been varied in different series of experiments. In each

series the experiments have been done under quite analogous circumstances, but notwithstanding, the time required to decalcify a square of a certain size in the same quantity of a given acid has not always been the same. Probably this has been caused by some differences in the structure of the bone. Such differences may exist even when the squares are cut out of the same plate. That for most acids it is difficult to ascertain at what time the squares are decalcified must also be taken into account. As a rule, the difference has been slight for the same acid, but, as might be expected, great for the different acids, as shown by the table No. I., in which I have compared the result obtained when using 4-per-cent. solutions of the different acids in a quantity of 3 grammes.

No. 1. Four-per-cent. solution. Three grammes.

	A. hydrochloricum. Time for each experiment.	Average.	A. nitricum.	Average.	A. phosphoricum.	Average.	A. sulphuricum.
Squares of 3 *mm* linear extent and 1.2 *mm* thickness	5. 4.30" 5.30"	5	7.20" 10. 6.30	7.54"	21. 21. 27.30"	23.10"	Circ. 12 days.
Squares of 4.5 *mm* linear extent and 1.2 *mm* thickness	4. 4. 5	4.20"	9. 8.30 7.	8.10"	33 30.30 34	32.30"	
Squares of 6 *mm* linear extent and 0.6 *mm* thickness	3.45 4	3.42"	7. 9	8	24.27.	25.30"	Circ. 8 days.
		4.20"		8.2"		27.3"	

It appears from this table that hydrochloric acid, in a shorter time than any other acid used, is capable of decalcifying bone, the proportion being when the time for this acid is taken = 1, for nitric acid = 2, for phosphoric acid = 7, and for sulphuric acid 50 to 60. The last acid is, as could be expected from the insolubility of sulphate of lime, far inferior compared with the others. When weaker solutions are used we find that the relative time for the first three acids remains about the same, as may be seen from the tables Nos. 2 and 3.

No. 2.	Three-per-cent. solution.				Three grammes.	
	A. hyrochlori-cum. Time for each ex-periment.	Average.	A. nitri-cum.	Average.	A. phosphoricum.	
Squares of 3 *mm* linear extent and 1.2 *mm* thickness	5. 6. 5. 6	5.30″	9. 8. 11. 13.	10.15″	51.30″ 52.30″ 45.30″ 48.	49.22

No. 3.	Two-per-cent. solution.				Five grammes.	
	A. hydrochlori-cum. Time for each ex-periment.	Average.	A. nitri-cum.	Average	A. phosphoricum.	
Squares of 3 *mm* linear extent and 1.2 *mm* thickness	10.15″ 10. 11.10″	10.28″	17. 18. 18.	17.40″	70.15″ 62. 73.	68.25″

The average time for the experiments related in these three tables is 6.46″ : 11.48″ : 48.17″, or, approximately, 1 : 2 : 8.

For sulphurous acid I have not been able to fix any time. I have had squares of 3 *mm* × 1.2 *mm* immersed in 15 grammes solution in a well corked and sealed glass for 300 hours. When opening the glass the smell from the gas was very strong. The bone was found bleached and slightly swollen; its upward turned side was so far decalcified as to admit a sharp knife to be thrust in for a little depth; the other side turned to the bottom of the glass was quite hard. From this we can conclude that it would take a very long time to decalcify pieces of bone of a size of some cubic millimetres. Small pieces taken from the cancellous substance are, however, decalcified when laid in solution of sulphurous acid for some hours. As some sulphuric acid after a time always is formed in aqueous solutions of sulphurous gas, the dissolving powder of the last may be attributed to the first named.

From table No. 1 is seen that the shape of a bone is a factor which has a great influence on the time necessary to dissolve its earthy substances; the larger its surface is in proportion to its volume, the shorter is, as may be expected, the time. Squares of 6 *mm* and 0.6 *mm* thickness = 21.6

cub. mm required but little more time than those of 3 *mm* × 1.2 = 10.6 *cub. mm.*

Beyond the great difference in time needed for the different acids in decalcifying bone, we find that their action differs also in other respects. Some acids, for instance sulphuric acid, swell the gelatinous substance. The thickness of the plates may be found increased from 25 to 30, or even in some places to 35, of their natural thickness. Partly this increase of thickness is due to deposits of sulphate of lime. A slight increase of thickness I have found also in plates placed in solutions of muriatic and nitric acids, but this increase seems to disappear when the plates are wholly decalcified. At least I have not been able to determine under the microscope any visible difference between cuts of such plates and those of the bone in its natural state. In solutions of phosphoric acid the form of the bone seems always to remain quite unaltered.

The bone when acted on by the different acids assumes different aspects. Phosphoric acid makes the squares quite transparent, so that the time necessary to decalcify them can be exactly ascertained by sight alone. When left in the solution for a time the part not decalcified is seen by transparent light as a dark square surrounded by a pellucid one. The process appears to be well defined, as with an ordinary magnifying glass the borders of the opaque part are well distinguished from the transparent ones. Hydrochloric and nitric acids give the squares a milky appearance, so that it is not possible to see when they are decalcified. The plates must be taken out of the solution and cut into. It is possible therefore that the time recorded for these squares has been too long compared with that for those immersed in phosphoric acid. More probably, however, the possible faults lie on the other side, as the cuts made in the squares to try their hardness give a freer access to the acid. The sulphuric acid produces a still more saturated white color to the plates. When washed out in water and dried the plates decalcified in hydrochloric, nitric, and phosphoric acids all take quite a pellucid appearance. Those in sulphuric acid, however, remain opaque, being

covered with white spots (sulphate of lime). I must not omit to say that the temperatures of the solutions during the experiments have been tolerably even, varying between 15° and 20° C.

It appears rather strange that mineral acids have not been used more frequently in carious and necrotic processes than hitherto has been the case. Not only are they excellent remedies, due to their chemical effects in extracting the earthy substance from the dead bone and thereby making it absorbable, but they are also valuable antiseptics; the most offensive smell is invariably removed when the affected part is soaked with a mixture of mineral acids not too much diluted.

The acid which up to this time almost exclusively has been used seems to have been the sulphuric acid. It has been tried both pure, in which state it acts mainly as a caustic, and diluted. G. Pollock,[1] who used it in both forms in cases of carious and necrotic processes of different bones, applied it pure in affections of the bone of the trunk; in those of the head he recommends a mixture of equal parts of concentrated acid and water. In the last form he says that it usually does not affect the soft tissues, nor does it irritate them subsequently. It is interesting to see that Pollock has used it with good result in cases where the pulsation of the brain through the exposed dura could be distinctly observed close to the edge of the necrosed bone. From the description given in Pollock's cases I should, however, think that the acid in this rather concentrated form acted more as a caustic, or a powerful stimulant, than as a solvent. The dead bone is said to be crumbled away from day to day in minute fragments. In the auditory canal and tympanic cavity, sulphuric acid has also been used, both pure and diluted, by Weber-Liel. The effect of the diluted acid seems, however, not to have been studied more closely; at least no details of it are given in the article.

[1] From his article in the *Lancet* I see that M. Chassaignac ("Mémoires de la Société de Chirurgie," vol. iv.) has tried and strongly recommended the use of muriatic acid for necrosis of bone generally. Dr. Pollock quotes Holmes ("System of Surgery," vol. viii., p. 637), who says that he has not found much benefit from its use. The works of Chassaignac have not been accessible to me, wherefore I do not know how concentrated he used the solution, or if he ever tried it in affections of the temporal bone.

It is exclusively as solvents that I here shall speak of the mineral acids. It has not been my plan to study their effect as caustics. As such they all, except chromic acid, may be superfluous in otological practice, as in the galvano-cautery we have a remedy by which we can reach our aim in a shorter and less painful way. From the experiments made in glasses, we can only come to the conclusion that muriatic acid of all the acids tried is the best solvent for the earthy particles of bone, and that the sulphuric, and still more the sulphurous acid, are rather unserviceable for the same purpose. How the different acids act in the meatus and tympanic cavity is another question which remains to be solved. Many things are here to be taken into consideration. First, how they are tolerated in the auditory canal and tympanic cavity. In this respect I have not found any difference. They all cause pain in the canal and drum cavity when applied too often. In the former I have once seen a circumscribed necrosis of the skin close to the outer aperture follow upon repeated instillations of a 2-per-cent. solution of muriatic acid. In the latter I have three or four times observed inflammation ensuing after a single application of cotton soaked in a 4-per-cent. solution of muriatic or nitric acid. The inflammation was accompanied with decrease of hearing, but disappeared in a couple of days without leaving any traces. In the tympanic cavity acids are tolerated much better. Whether this is caused only by attenuation, or even neutralisation, of the acid, I shall leave unanswered. I can only state that usually the fluid retained in the cotton has had an exquisite sour reaction, when removed after twenty-four hours. In some few cases it was found neutral, or even of an alkaline reaction. Provided, therefore, that the indication is only to remove a sequestrum which, on account of its size, cannot be taken out through the auditory canal, or to decalcify a bone so situated that we need not fear the consequences of pressure on its surroundings if it should swell, the acid which does this in the shortest time is preferable. It is, however, doubtful whether or not the same holds good when the dead bone is deeply situated, in continuity with healthy bone, and for the greatest part

covered by its natural linings. In such cases we have to take into consideration the swelling whereby invariably the vital process, tending to absorb the decalcified or partly decalcified bone, seems to be inaugurated. That such swelling, in a mechanical way possibly, can give rise to unpleasant complications, is *a priori* not at all unlikely. From this point of view it may be advisable in some cases of deep-seated necrosis first to try phosphoric acid, or a very weak solution of muriatic acid, especially when the effect cannot be watched daily. The following notes from some cases are taken as samples of differently located necroses.

CASE 1.—Peter Ouren, five years, was brought to my office 8th of June, '87. He was rather a delicate and pale-looking boy. Two years previously he had scarlatina, at which time his ears began to discharge, and have continued to do so ever since. He heard a watch brought into contact with concha (normal distance three feet $h. = \frac{c}{36}$). Otoscopically: drums mostly gone; on right side malleus with a little part of the manubrium present; on the left all ossicles gone. He was treated for a while with boracic acid (method of Bezold) and later with instillation of spiritus absolutus, pure and with some boracic acid solved in it. The discharge soon diminished but did not entirely cease. In the middle of July I noticed on the left side denuded bone in form of a stripe at that place, which normally is covered by the hammer handle. At that time the patient was taken home. I saw him again towards the end of October the same year. He could then hear ordinary conversation at one foot both sides. Still some discharge. Otoscopic. right side unchanged; left, most part of promontory denuded. The naked bone is of a yellowish-white color. Its superficies smooth; its inferior and superior margins are free and here the end of a bent probe can be introduced under it. It feels firmly attached to the substratum. Attempts to move it cause pain. One drop of concentrated nitric acid was put on the bone by a small glass rod every second or third day for four or five weeks. This made the superficies uneven and of a dark color in the centre. The exfoliation gradually became so manifest, that I tried to remove the bone with a pair of forceps. As it, however, was rather large and not quite separated, I did not succeed. At the beginning of December the patient was infected by measles and taken home. Towards the end of August, 1888, I saw him again.

The dead bone was then quite loose, but of the same size as before. Attempts to remove it still causing pain I introduced some drops of a four-per-cent. solution of nitric acid into the ear and left it there for half an hour. Having repeated this twice the bone became so diminished that it easily could be taken out. The inner wall of the tympanic cavity appeared to be covered with a membrane, in the anterior part of which was seen a hole through which a probe could be introduced 1.5 *mm.* He can understand whispering at one foot's distance on both sides.

In this case I several times proposed to remove the bone by an operation, but as the relatives of the patient did not consent to the use of anæsthetics, and it was impossible to do without them, on account of the great sensitiveness and timidity of the boy, I had to give it up. Whether or not the use of absolute alcohol had occasioned the sloughing of the mucous membrane and secondarily necrosis of the bone, I leave undecided. On the right side it produced no necrosis.

Case 2.—Oline Larsen, fifty-one years old, has been rather hard of hearing as long as she can remember. Five years ago she was taken ill with general stiffness and cold in the whole body, accompanied by dizziness and pain in the head. The dizziness forced her to keep her bed for a week. Since that time she has always been liable to dizziness especially when she suddenly turns round. In June, 1887, she had humming in the ears and the hearing became worse. Three or four weeks ago she noticed some discharge from the ears. She can hear a watch when applied to auricle right side. Left she cannot hear either watch or acoumeter of Politzer, but tuning-forks of usual size close to the ear. Very loud conversation is heard at one to two feet. Air-douche by Eustachian catheter reveals good permeability of the tubes on both sides ; on the right a whistling sound as by perforation of the drum. Otoscopically, both sides, membranes much retracted ; rather large defect in the innermost part of the bony wall, especially on the left side. In the opening a bone of brownish color and uneven surface is seen to protrude. Immediately under it the stapes with its muscle protrudes free into the auditory canal. It is freely movable and by moving it the patient heard a grating sound. The bone is situated 3 or 4 *mm* farther in

than the upper margin of the membrane ; it proves immovable ; no grating under the probe ; pressure on it leaves small spots of blood (*vide* fig. 1). On the right side swelling of the auditory canal makes it difficult to perform a closer examination of the site of the bone. Pieces of dark crust and half-dried exudation incompletely cover the parts on both sides. On the upper and innermost part of the wall of the auditory canals some granulations are visible. Syringing sometimes, especially when the fluid was not sufficiently warm, causes dizziness. On the right side the fluid passes into the corresponding nostril.

When the parts had been thoroughly cleansed, I commenced to use a solution of muriatic acid, first 2-per cent., then, as this was borne without inconvenience, 4-per cent. Small pieces of cotton were soaked in acid, and laid on the bone. Twenty-four hours later, when the cotton was removed, the fluid retained in it usually was found to be of a neutral reaction. The color of the bone soon changed into white ; by the probe it was not felt so hard. When touched by a sharp instrument spots of dark blood appeared. After four applications of the acid the bone became somewhat enlarged (*vide* fig. 2). At the middle of December it began to diminish. The superior part was gradually absorbed, whereby a lower more prominent lump was formed. This has lately diminished more and more, and a little cavity about 1 *mm* behind its anterior margin has formed on its outer surface (*vide* fig. 3). The bone is now harder again, and does not bleed so easily when touched with a needle. Unquestioned, the patient states that she feels much better ; the dizziness has become less, and she is clearer in the head and not so bewildered as before. Hearing variable, but usually a little better.

FIG. 1. FIG. 2. FIG. 3.

(The patient held her head bent to her right side, at an angle of 25° to 30°, when the drawings were taken.)

The bone here denuded must be considered half necrosed. Its uneven surface coated by crusts showed that its nutrition from the periphery was cut off, but the hemorrhages appearing when the

bone was touched with a sharp instrument proved that it was pervaded by vessels, and consequently not a sequestrum. That the swelling after application of acids in this case was but slight, I would explain by the absence of periosteum. The periosteum furnishing the bone with the greatest part of regenerative material, the reactive process tending to absorb the decalcified bone must be relatively slow. Considering the large destruction of the inner upper part of the auditory canals, we must believe that the process began on this favorite spot of necrosis.

CASE 3.—Johan Reiss, Arendal, thirteen years old, came under my treatment the first time in the winter of 1884. He had then on the left side a chronic suppurative otitis media of several years' standing. A polypus was on the anterior wall of the meatus. After four weeks' treatment the catarrh ceased. No relapse before the beginning of 1888. I saw him again at the end of August. Rather copious discharge of an offensive smell. At the upper margin of the drum was a hole the size of a hemp-seed. The hole was partly filled with necrosed tissue ; some granulations at its upper circumference (*vide* fig. 4). By probing, denuded bone could be felt at the bottom of the hole, but no grating. He can hear the watch at one inch ; with the right ear at two feet. By Eustachian catheter, good permeability of the tube. No whistling sound that could indicate perforation. When the granulation was destroyed, grating could be felt in the upper region. He was treated with muriatic acid, 4 per cent. lotion once or twice weekly. After four applications a whitish mass gradually filled up the hole, so that no probe could be introduced (fig. 5). At that time the patient felt a slight throbbing pain in the ear for a short period. The mass was of a consistence like cartilage. When touched with a pointed instrument small spots of blood appeared. The use of the acid was suspended as soon as the white mass appeared. When in the course of three to four days it had been absorbed, the bad smell of the discharge came back, until a renewed application of acid caused it to vanish and the white mass to reappear. In the beginning of October the hearing in the affected ear commenced to improve ; the discharge, having been scanty for a time, entirely disappeared. A probe, bent at an angle of 115° at a distance of one *cm* from its end, could be introduced (so far that the angle just touched the upper margin of the cavity), while its end was still felt free. The upper circumference of the hole is undulate. Processus brevis mallei had become absorbed

(fig. 6). The patient was kept for a couple of weeks under observation, to see if any relapse should come on. When leaving he heard watch at 10 inches, $h = \frac{10}{30}$.

FIG. 4. FIG. 5. FIG. 6.

In the last six months I have treated several patients with caries of the inner upper part of the bony meatus, in which the affected bone has been situated on a place corresponding to that in the above case. In most of these cases there was no communication with the tympanic cavity. The affected bone has been found almost constantly covered with polypoid growths or granulations, which were destroyed with the galvano-cautery or chromic acid. Afterward, a hole has usually been visible, varying in size from that of a pin-head to that of a hemp-seed. When hydrochloric acid had been used for a couple of times, the hole has been filled with a vascular mass, showing spots of blood when touched with a sharp instrument. It can hardly be doubted that this mass was cartilage proceeding from the bone bordering the dead or half-dead part. The final result was that a hole with smooth margins, and considerably larger than that originally visible, has formed in the region above the drumhead. This hole has been the entrance to a cavity of more or less extension.

The prognosis is good in cases where the affection is limited to the meatus and the adjoining part of the roof of the tympanic cavity. If I take into consideration only the patients that have remained sufficiently long under treatment, I have had in the last six months seven patients in whom a cure had been obtained in an average time amounting to a little less than eleven weeks (in no case less than four and longer than sixteen weeks). The hearing has in all cases been considerably improved. In cases where there has been communication with the tympanic cavity, or where symptoms indicating an affection of the malleus have been present, the result has not been so favorable.

CASE 4.—Julie Halvorsen, eight years old, was brought to my office September 24, 1884. Three years previously her left ear had commenced to run. Cause unknown. A sister died at the age of fifteen years, from a brain affection caused by a chronic purulent otitis, from which she had been suffering since childhood.

St. pr.: right ear normal; left, discharge of an offensive smell. In the drumhead a perforation of the size of a hemp-seed close to the posterior margin. She was treated with different antiseptics, and during a long period with sulphurous acid in accordance with the method of Woakes. As long as she remained under treatment the discharge was scanty and inodorous, but when during the holidays she stayed away for a couple of months, it became more copious and offensive. During these periods the perforation increased in size, the greater part of the *Mt* being finally destroyed. In the fall of '86 a small granulation appeared on the posterior part of the promontory. This granulation was repeatedly destroyed, but reappeared after a shorter or longer period. Later grating could be felt by touching the spot where the granulation was visible. In the middle of September, '88, I commenced to use instillations of nitric acid of 4 per cent. The effect of this treatment was soon visible so far as the manubrium, which had up to that time been seen as a straight line, fixed by its free end to promontory, after a couple of instillations became flexible and somewhat swollen. The instillations were soon substituted by small pieces of cotton soaked with acid, laid upon the place where grating was felt. The fluid retained in the cotton when the latter was removed after twenty-four hours was generally found neutral or of a slightly acid reaction. After these applications had been used a couple of times a whitish, rather consistent growth, which proved to be vascularized, came forth. By and by the manubrium became curved against the hammer-head. Later when hydrochloric acid was substituted for nitric, the growth increased in size, protruding 6 to 7 *mm* over the promontory. Its size was unaltered for a couple of days, during which the discharge almost ceased. The use of the acid was stopped when the growth was visible, but as the discharge and the bad smell had reappeared when this had gone back, the acid was applied again.

The patient is still under treatment. Probably the affected bone in this case is deeply situated, and it may be doubtful whether or not acids in this case will bring on a cure. For

a while I tried instillations of 2-per-cent. lotion of hydrochl. acid, thinking that perhaps other parts of the temporal bone than the promontory might be affected, but not only did these instillations cause pain when used repeatedly, but they also caused a round ulcer about 3 *mm* in diameter in the skin of the meatus, near its outer aperture. As this ulcer went through the whole cutis, its healing took a couple of weeks.

That the manubrium in this case, in spite of the prolonged treatment with sulphurous acid, preserved its stiffness, shows how little this acid is apt to decalcinate bone, however slender it may be, when protected by periosteum.

I have given an account of the last three cases in order to illustrate how acids act on bone that is more or less denuded, but still in connection with the body. In Case 2, where the affected bone was situated deep in, and consequently for the most part out of contact with, the periosteum, we see that the acid occasioned but *little* swelling. In Case 3 the swelling must have been relatively *greater* as the supposed cartilage repeatedly filled up the perforation. Once this patient had symptoms indicating pressure (slight pain and throbbing in the ear) some hours after the application of the acid. In the last case, where the affected bone was still covered with periosteum (mucous membrane), we see a *very great* swelling again and again following the applications of acid.

It is not improbable that mineral acids—especially when used freely—are capable of absorbing the earthy substance of healthy bone, at least of that part of it which surround the diseased. Whether or not this is followed by an absorption of its organic substances we do not know. If so the bone may or may not be regenerated. Judging from the experiments gained by operations where bone is taken out of its periosteum, the former is probable. The only case that could give any hint in respect to decalcifying and absorption of healthy bone, is that of No. 4, where the manubrium was decalcified. There is up to this date nothing to indicate absorption of its cartilage. The manubrium is, however, not only an exceptionally slender bone, but is,

when separated from the drumhead, under abnormal nutritive conditions; nothing can therefore be concluded from this case.

The foregoing communication may be sufficient to show the efficacy of mineral acids, and especially of the muriatic acid, in necrosis of the temporal bone. That acids also may be useful in calcareous infiltrations of the drumhead and the mucous membrane of the middle ear, is more than probable.

REPORT OF CASES OF DISEASE OF THE MASTOID PROCESS. WITH REMARKS.

(ARTICLE III.)[1]

BY HENRY FERRER, M.D., SAN FRANCISCO, CAL.

CASE 20.—**Acute Purulent Inflammation of the Right Middle Ear, Accompanied by Intense Pain; Chiselling of Eburneated Mastoid; no Communication Obtained; Cure in Seven Months.**

Boz. Rad., male, forty-three years old, consulted me, October 14th, 1886, for acute purulent inflammation of the right ear, accompanied by severe pain. He had earache a few nights, applied home remedies until the ear began to discharge, but found no relief. Discharge muco-purulent, and not very profuse. After syringing and drying, *Mt* very much inflamed, and with a very small perforation through which pus oozed out. I enlarged the perforation freely downwards, inflated with Politzer, and, after drying carefully, applied a Priessnitz compress. That night he slept for the first time, but still had sharp pain at times. He came daily to my office until November 2d, being treated in the same manner; the discharge had decreased, and Priessnitz was dispensed with. Patient was seen on the 6th, 8th, and 11th. On the 15th he left for New York, against my advice. There was then scarcely any discharge, no pain, and the patient seemed to be recovering.

On his return, December 19th, he related, that during the journey his ear had again become so painful that on his arrival in New York, December 6th, he had consulted Dr. Roosa, who attended him for a few days, and informed him that possibly the mastoid

[1] Article I., these ARCHIVES, xvii., p. 308, etc.; Article II., these ARCHIVES, xviii., p. 25.

were involved. On the train from New York to San Francisco he had continuous pain, increasing greatly at night.

I found some muco-purulent discharge in the meatus; the latter was very much narrower by collapse of its upper wall, thus preventing good inspection of *Mt;* what could be seen of this was dark-red; upon inflation with Politzer (catheter could not be introduced on account of obstruction from deviated septum) a very small perforation was found. He complained of intense pain in the ear itself, over the mastoid region and shooting forward to the right orbital region. I at once performed paracentesis of that portion of *Mt* which was visible, inflated thoroughly, and applied Priessnitz. The mastoid region was neither swelled nor tender. In this way he was attended to daily up to December 31st. The pain at night gradually increased, but was almost absent during the day. January 1st I succeeded in keeping him at home, and applied ice to mastoid and warm baths to meatus continuously. The discharge from meatus still was very slight, and swelling of its walls was the same. January 13th and 14th, he had a very alarming night, becoming delirious and violent, so that his family became afraid of him. Upon his return from New York, and since then, I had advised opening the mastoid repeatedly, but he would not listen to it. With the kind aid of Prof. R. Beverly Cole, his family physician, I succeeded in convincing him, and operated January 15th; at this time, though somewhat sensitive upon strong pressure, the external integuments of mastoid were perfectly normal; the amount of discharge and the appearance of external meatus had not changed.

Operation: Drs. Beverly Cole and de Vecchi assisting. Ether narcosis by Dr. Whitwell. Incision in usual manner, 6 *cm* long, through the normal soft tissues; periosteum normal, well attached to the bone; external plate normal; *spina supra meatum* and canals for emissary vessels not well defined. I began to chisel in usual spot; I chiselled patiently through eburneated bone to a depth of 2½ *cm* before any air cells could be detected; I then came to what I supposed to be the antrum—a very small cavity running inwards and upwards. No signs either of pus or of any degenerated mucous membrane, and no communication was obtained. The chiselling process lasted 42 minutes, on account of the density and hardness of the bone. Dressed with iodoform gauze, bandaged in usual manner, antiseptically.

January 16th.—Felt very bright; had a very good night; bandage partly renewed.

January 17th.—Had considerable pain during the night; bandage renewed, all the gauze being removed from the bone and replaced. He was visited twice daily until February 1st; the discharge from meatus ceased entirely immediately after the operation; after inflation the ear was syringed with carbolized water. The bone soon began to granulate. February 11th he was allowed to go out, and called at my office to have a nail applied; this was over 2½ *cm* long. He still complained of some pain, but was able to attend to his business, and slept very well. From now on he was treated daily in the office. March 2d the nail was shortened; March 5th, shortened again; now 1½ *cm* long, kept in place by a headspring. In April he was treated daily. The lumen of external meatus normal, *Mt* pale-red, and thickened, $h = \frac{0.35}{5}$. End of April nail was dispensed with; by May 6th the fistula in the bone had closed perfectly. I did not see him again until the 21st, when he was dismissed.

The question now is, was the intense pain caused by disease of the mastoid, and was the operation justified? Similar cases have often been reported, cases in which it was expected that a diseased mastoid would be found, and in which this same eburneated condition, with neither purulent nor catarrhal affection of the cells, presented itself. Was this, possibly, a simple case of neuralgia of the mastoid, or was some part of the bone affected which was not reached by the operation (some of the horizontal cells) or which was inaccessible? I have no doubt whatever that any other aurists would have operated in the same manner; and the result speaks for itself. The collapse of the upper wall of meatus is almost a positive symptom of retention in the mastoid cells. The continuous intense pain and delirium certainly point to congestion of the meninges. It was difficult to decide whether the cell reached at a depth of 2½ *cm* was the antrum; it was too small and too deep to be positive of its contents. It is probable, however, that this was the antrum, for, in examining a large number of bones, I have found that the denser the bony substance of the mastoid the smaller the antrum, and that in cases of eburneation the latter even lies above the upper wall of the meatus, is placed horizontally, and is flattened, the inner plate being,

as a rule, thinner than one would expect. I possess a large collection of these bones, and whenever I look them over I cannot but ask myself how such an antrum could be reached by following the rules of Schwartze. It is probable that in all cases reported, in which after penetrating 2½ *cm* and over the operation was abandoned, such an antrum existed. The reason for keeping the nail of such length was, that certain portions of the bone would not granulate and remained rough.

CASE 21.—**Acute Purulent Inflammation of Right Middle Ear with Extensive Œdema of Head and Face; Subperiosteal Abscess; Empyema Mastoidei; Operation; Communication; Cure in Eight Weeks.**

Almada, aged fifty-three, Portuguese, came to the German Hospital February 8, 1887. For the last two weeks he has been treated in the country for facial erysipelas.

Status præsens: Patient is tall, poorly nourished, his head has been entirely shaved; he is a picture of distress. His entire head is swollen; eyelids cannot be separated; nose is so swollen that he keeps his mouth open for breathing; his lips are still more swollen, and the upper one is very dry. Swelling is more marked on the right than on the left side; thus the left auricle is slightly œdematous while the right is very much thickened. The right side of the scalp has also a different appearance, being almost purple in color. The nearer the right temporal region, the denser the swelling; it is most marked over the mastoid region—this feels hard and is very sensitive to pressure. The right meatus is almost entirely closed and contains a thin purulent discharge. Temperature, 38.6. I ordered him to be kept ready for operation, and his head to be washed with soap and carbolic solution.

February 9th, A.M.—Temperature, 38.4.

Operation: Dr. Morse assisting. External incision 5 to 6 *cm* long through the infiltrated, lardaceous, soft integuments which were 3 to 3½ *cm* thick. This diminished the tension, and was soon followed by copious parenchymatous hemorrhage, which stopped in a few minutes after compression with sponges. About one teaspoonful of pus escaped; the periosteum was detached from the bone upwards above the level of the auricle, and partially in the meatus. The surface of the external plate did not present any marked change and there was no fistula in the bone. *Spina supra*

meatum as well as emissary canals well defined. I then proceeded to chisel in usual spot, and after perforating the external plate which was 6 to 7 *mm* thick, I arrived at a cavity filled with pus. Scoops were now used, and though the bone was exceedingly hard, I penetrated to a depth of of 2½ *cm.* In syringing, there was very free communication. The cavity was filled with iodoform gauze, and an antiseptic dressing applied.

February 10th.—Temperature 37.4 A.M. ; 37.6 P.M. Slept well. Œdema of the face, especially on left side, considerably less ; opens left eye with ease ; the purple discoloration of the head has also changed into a dark red (complexion naturally deep brunette). Bandage was removed on account of being saturated with blood ; gauze entirely removed from fistula. Syringed well with carbolized solution ; communication very free. Dressed and bandaged in usual way.

February 11th.—Temp. 37.2 A.M. ; 37.4 P.M. Opens right eye ; face now looks natural ; œdema of auricle and meatus much less ; discharge hardly noticeable. From this time on had no fever ; he was attended daily and treated in same manner. The fourth day after the operation he was allowed to sit up out of bed. The fistula began to granulate rapidly, so that March 5th I applied a conical led nail 2½ *cm* long, held by a headspring ; after this date he was treated daily in the office as an outdoor patient.

March 11th.—Nail removed ; is still almost 2 *cm* long. In a few days afterward the fistula closed entirely ; March 28th he was dismissed as cured. Meatus of normal width, *Mt* thickened, $h = \frac{c}{5}$.

To most specialists, the fact that patient had been treated for erysipelas would not seem astonishing. We had in this case a dense mastoid with a very thick external plate and with a very few air cells of large size communicating freely between themselves. The subperiosteal abscess was undoubtedly not a primary, but a secondary one, formed by gravitation of the pus along the posterior and upper wall of the meatus. This was also the cause of the intense œdematous infiltration of the whole right side of the head. The nail was left out though still 2 *cm* long, because the discharge from meatus had ceased, and the fistula in the mastoid had contracted so much after the nail had been left out for a few minutes, that its introduction was very painful and difficult.

CASE 22.—**Sub-Acute Catarrhal Inflammation of Right Middle Ear, with Purulent Inflammation and Retention of Pus in Mastoid Cells; Spontaneous Subperiosteal Perforation Outwards; Operation; No Communication; Recovery in Four Weeks.**

Ervine P——, male, three years old, contracted a severe cold five weeks ago. About this time he complained of his right ear, but not sufficiently to make him cry; in being washed he dreaded to be touched on the left side. He was kept in the house, and his ear covered with cotton. There was no discharge from the ear. During this time, the child's general health was poor; he lost considerable flesh, and looked very pale; during the day he was quite playful, but at night he complained about his ear, and was very restless. Whilst washing him, on the morning of February 18th, his mother noticed a swelling behind the ear, and she came to my office very much alarmed, remembering that her next door neighbor had lost the child, described in my last report as No. 15.

Status Præsens: Left auricle standing almost at a right angle; behind this is a diffuse swelling over mastoid, the skin covering which is still of a normal color. This swelling feels soft, and is very sensitive to pressure. External meatus perfectly normal. *Mt* of uniform red color. I applied a Priessnitz compress, and decided to operate the following morning.

February 19th.—Operation: Ether narcosis. Dr. de Vecchi assisting. Incision through mastoid swelling down to the bone; to my astonishment only a few drops of pus escaped, the swelling consisting chiefly of fungus granulations. The bone was denuded of periosteum, and its surface felt rough. At point of election the external plate was somewhat discolored, and a very fine fistula was found here. With a sharp spoon this external opening was enlarged, and the cavity carefully scooped out and syringed with carbolized solution, packed with iodoform gauze, and an antiseptic dressing applied. Narcosis excellent.

February 20th, A.M.—I found the boy dressed and playing; no fever; his whole appearance already much improved. I had him put to bed; renewed the bandage without removing the gauze from the wound.

February 21st.—Sleeps well, appetite good, wants to get up. Removed dressing entirely, no sign of suppuration. Rebandaged.

February 23d.—As yesterday, same satisfactory condition. Was allowed to get up.

February 24th.—First traces of pus, and formation of granulations in mastoid.

During the remainder of the month the boy was visited and treated at his home once a day. March 1st he called at my office, had a conical lead nail 2 *cm* long inserted and held with a spring. March 4th, nail shortened, and on 7th left out entirely, on account of irritation of skin. March 8th the fistula closed entirely, covered with sublimated gauze, and held by a spring. I saw him twice again, the last time on the 19th, when all bandages were removed, and he was dismissed as cured. *Mt* thickened, pale red; $h = \frac{0.02}{6}$ very much improved after inflating by Politzer.

I have seen the boy repeatedly since; *Mt* has remained dull, but his hearing is almost normal.

The principal feature in this case was the absence of discharge from the middle ear; it almost looks as though this were a case of primary purulent inflammation of the antrum and its continuations. No doubt there was, at first, an *otitis media catarrhilis acuta*, with an identical process in the antrum; but, for some unknown reason, suppuration took place in the antrum, and not in the middle ear. The absence of the very intense pain, which is usually present in cases of purulent retention in the cavum tympani, also supports this opinion. The means of ascertaining positively the presence of secretion in the tympanum—catheter and Politzer—were not applied at my first visit; but any large increase of secretion would certainly have been seen upon inspection. During the entire treatment there was neither earache, nor any other ill effects, caused by the injected fluid running into the middle ear.

CASE 23.—**Chronic Bilateral Otorrhœa in a Deaf and Dumb Child; Large Polypus in Each Ear, Producing Retention of Pus; Caries Mastoidei on Left Side, with Spontaneous Perforation Through the Bone and Soft Tissues; Operation; Communication; Cure.**

L——m, female, aged nine and a half years. Was brought to me February 6, 1887, with a swelling over left mastoid. The child is very robust, and is apparently in good health, an inmate of the Berkely Deaf and Dumb Asylum for the last year. When two

years old she had scarlatina, with diphtheria, during which both ears began to discharge ; they have been discharging ever since. Shortly afterwards the mother took the child to Chicago, and had the ears attended to by a physician, but finding no improvement after a few months she returned to her home in Denver. At that time the child had a small lump behind the ear, but this swelling disappeared afterwards. When about four years old, while trying to cross a railroad track, she was struck by a passing train, receiving a scalp wound and being made unconscious for one hour. At home the ears were attended to at intervals without any benefit ; and the mother, being satisfied that the child would never recover speech, moved to California, and placed her in the above-named asylum. Here also she attempted to have her child's ears treated, but was unfortunate enough to fall into the hands of a practitioner who advised her to do nothing, that the discharge from the ears was unpleasant, but not dangerous. In the asylum, the ears, which had a very fetid discharge, had been syringed daily, by order of the superintendent, Mr. Wilkenson. End of January a swelling presented itself on the left mastoid region ; a practitioner who was summoned opened this and evacuated very fetid pus ; a few days later the child was sent to me.

Status Præsens : From both ears very profuse, fetid, bright-yellow, purulent discharge.

Right Side : After syringing and drying, found the bony portion of external meatus filled with a large polypus. All means of testing the hearing gave negative results, with the exception of T. F., which was heard when applied to the bone.

Left Side : No hearing whatever ; chronic otorrhœa. A large polypus fills the entire external meatus. The meatus is of normal width ; no swelling of its walls. A considerable swelling over mastoid region, which presents a small fistulous opening, clogged with granulations at the level of the upper wall of the external meatus. The skin over the swelling was purple and fluctuating ; upon pressure, pus would ooze out of the fistula. The child was sent to the German hospital, with proper directions for disinfecting and shaving, so as to be in readiness for operation the following morning.

February 7th.—Operation : Drs. Morse and de Vecchi assisting. The child having been etherized, I began by snaring off the aural polypi. Incision in usual manner, taking in the fistula. A large number of fungous granulations were first thoroughly removed by

scooping. Quite an amount of pus escaped during the incision; hemorrhage was very slight. The external surface of the bone was rough, and about 2 *cm* from posterior wall of meatus a fistula was found, in which a director could be introduced through soft masses to the depth of over 2½ *cm*. The fistula was enlarged by chiselling, and the atrophied external plate snipped off, as far as undermined, with Luer's sharp bone forceps. There then presented itself a large cavity filled with an extremely thick, fetid, cheesy substance; this was scooped out to the dept of 2 to 2½ *cm*. In syringing either way, very free communication existed. The cavity was packed with iodoform gauze, and an antiseptic bandage applied.

There was no reaction whatever; the child had no fever; she was kept in bed two days, treated and bandaged daily. The third day she was allowed to walk in the garden. February 12th, left the hospital; after this she called daily at my office.

February 13th.—The bone was granulating so fast that a nail had to be applied; the discharge had lost its fetid odor, and was very trifling; it increased with the formation of granulations, and decreased with the insertion of the nail. As injections, 2½-per-cent. solutions of carbolic acid were used.

March 4th.—The child has been attended daily. There are no granulations visible in the middle ear, the mucous membrane, though succulent, is pale. The end of the nail can be seen through the meatus; it is no longer in the cavum tympani, but has been displaced into the inner portion of the meatus by caries. The meatus being abnormally wide, the discharge scanty, the nail cavity no longer communicating with the middle ear, and no denuded bone being felt, the nail was left out altogether. In a few days the nail cavity had closed, leaving a depression externally. The membrana tympani is entirely destroyed, and no ossicles are visible.

Right side: The polypus was removed when the left side was operated upon. This ear was also treated daily with injections of carbolized water. The remnants of the polypus, which were found to proceed from the roof of the middle ear, were repeatedly cauterized with chromic acid. On this side also there was total absence of *memb. tymp.* and ossicles, the mucous membrane being in same condition as in the fellow ear. The suppurative process yielded readily to this treatment; the discharge, which at first was profuse, purulent, and fetid, became scanty, muco-purulent, and

only moistened the inner end of the cotton plug which filled the meatus.

In this condition the child was taken away by the mother, with the proper appliances and directions to syringe the ears once a day with carbolized water.

October 6th.—She returned with a very profuse, fetid, purulent discharge from both ears. The child had been neglected, for I removed from the bottom of right meatus two, and from the left three, plugs of cotton impregnated with decomposed matter. I syringed thoroughly with a solution of sublimate $\frac{1}{2000}$; after drying, I found the epidermis of the bony portion of both meatus macerated, but, strange to say, no visible change in the middle ears. Boric-acid powder, and then cotton, were applied to the meatus.

October 7th.—Very little discharge, almost inoffensive, less on left than on right side. Carbolic solution used for injection, boric-acid powder for walls of meatus.

October 8th.—Still less discharge. Walls of meatus still red, denuded of epidermis. The mother was provided with a suitable powder-blower, and instructed never to apply the powder until the ears had been carefully syringed. The child returned to the deaf and dumb institute, and is to be brought once a week for inspection.

October 29th.—I found four pieces of cotton filling the entire left meatus; they were dry, and there was no discharge perceptible. In the right ear no discharge, some dry boric acid. Advised the same treatment to be continued, but only twice a week, and to bring the child again should the discharge make its appearance.

November 10th, 1888.—I have not seen the child again, but I have been informed repeatedly that she is in the institution, and has had no more trouble with her ears.

Case 24.—Acute Purulent Inflammation of Left Middle Ear; Empyema Mastoidei; Spontaneous Subperiosteal Perforation; Operation; No Communication; Cure in Three Weeks.

Albert C——, aged six and a half, was brought to me by his mother, April 1, 1887, with otorrhœa of left side and swelling of mastoid region.

The child was well nourished, and healthy. Seven weeks previously, without known cause, had had a purulent discharge from

the left ear; this had been treated with injections of water and tea; on the day of consultation a swelling presented itself behind the ear.

Status præsens: Left side, auricle normal; copious muco-purulent discharge from meatus, the walls of which are swollen. After cleansing and drying *memb. tymp.* injected, a small, pulsating perforation visible. The mastoid region swollen, integuments red; very painful to touch.

April 2d.—Operation: Dr. X. Scott, of Cleveland, assisting. Incision through swollen portion of mastoid down to the bone, emptying some pus from a subperiosteal abscess. The external plate denuded of periosteum, and here was found a small fistula. The latter was enlarged with chisel and hammer, exposing a cavity in the mastoid process filled with pus. This cavity was scooped out to a depth of 2 *cm.* Injections with carbolized water used, and no communication obtained. Dressing with carbolized gauze and antiseptic bandage.

April 3d.—Bandage and a portion of the packing in the wound renewed; no discharge from meatus.

April 4th.—Same condition as yesterday; dressing renewed; no discharge.

April 5th.—Could no longer keep in bed. Granulations begin to form. He was treated in the same manner until April 12th, when he called at the office and had a lead nail 2 *cm* long inserted.

April 16th.—The mastoid has filled up with granulations so rapidly that it is hard to keep the nail in; there is no discharge from meatus, no perforation visible, and the *Mt* is only slightly injected; the nail was removed. The fistula, which contracted rapidly, was kept covered with sublimated gauze, held by the spring. The mastoid was washed with carbolized water every other day.

April 23d.—The nail bed had closed entirely.

April 27th.—Fistula closed, leaving a linear scar; was advised to wear cotton in the ear for a few weeks.

November 7th.—Has not had any trouble with his ear since; looks well and robust. In mastoid a linear scarcely depressed scar. *Memb. tymp.* still somewhat dull and thickened; $h = \frac{0.9}{5}$.

CASE 25.—**Acute Purulent Inflammation of the Right Middle Ear; Empyema Mastoidei; Subperiosteal Ab-**

scess by Gravitation; Operation; No Communication; Cure in Three Months.

Antonio Silva, fifty-four years old, a Portuguese, consulted me May 6, 1887, and gave the following history: About six weeks ago he was working in a field, when towards evening he was taken suddenly with a severe pain in his right ear, lasting all night and the following day until the ear began to discharge. He then went to Sacramento, where he was under the care of an aurist for one week. Finding no relief he came to San Francisco, and placed himself under the care of another aurist for the next three weeks. The pain in the ear has never left him entirely; the discharge has been very profuse. During the past few days the pain increased, and his neck and ear began to swell; the discharge has remained the same. Patient was never sick before; he is now very much emaciated.

Status præsens: Auricle standing from the head, its posterior surface swollen; the meatus filled with bright green pus; its walls so much swollen that no view of *memb. tymp.* can be obtained. The mastoid region presents a diffuse swelling, extending backwards into the occipital region and downwards into the neck. The swelling over mastoid is of dark-red color, feels hard to the touch, and is exceedingly painful. Upon inflation with Politzer the air passes freely; râles and perforating sounds are heard. I sent him at once to the German hospital, with the directions to give him a bath, to shampoo his head, and to shave the temporal and mastoid regions.

Patient would not submit to an operation; was kept in bed, Priessnitz compress, the meatus syringed two or three times daily with carbolized water. He had so much pain during the nights of the 6th, 7th, and 8th, in spite of opiates, that he decided to be operated upon.

May 9th.—Operation after Schwartze; ether narcosis. Incision 6 *cm* long through the infiltrated tissues, which were $2\frac{1}{2}$ *cm* thick, The periosteum detached not only from the mastoid process, but also from the posterior wall of external meatus in its entire length; this was ascertained by the introduction of a probe emptying some pus. External plate somewhat rough; no fistula. *Spina supra meatum* and emissary canals well defined. In the situation of the latter, the so-called spot of selection by Schwartze, I began to chisel. After penetrating 3 to 4 *mm* greenish pus began to ooze out profusely. Upon probing I found the mastoid transformed into

an abscess ; the external wall of this was chiselled to a width of 2 *cm*, and the cavity scooped out to a depth of 3 *cm*. The hemorrhage was comparatively small. No clear communication was obtained in syringing. Dressed with iodoform gauze ; bandaged antiseptically.

May 10*th*.—He had some pain during the night ; no opiates ; no fever ; his general appearance is much improved ; the bandage is saturated with blood ; the gauze in the meatus saturated with pus ; the gauze in mastoid partially renewed ; bandaged in same way.

May 11*th*.—He had no pain, slept all night, this being his first good night since the beginning of his ear trouble. Very little pus was found in the meatus, none whatever in the wound. The gauze is firmly adherent to the edges of the wound. Syringed with 2-per-cent. carbolized water. Usual dressing.

May 12*th*.—Same condition as yesterday ; he was allowed to get up.

May 13*th* to 16*th*.—Discharge has almost entirely ceased, only the inner end of the cotton pellet filling the meatus has traces. He has been treated daily in usual manner.

May 16*th*.—He leaves the hospital to be treated at my office. The mastoid begins to granulate nicely, and consequently the discharge from the same has increased. Same treatment.

May 26*th*.—He has been attended daily in usual manner ; the discharge from mastoid still profuse, and the fungous granulations required reduction by cauterization with nitrate of silver on several occasions. The cavity is lined with granulations except above where the bone is still denuded and rough. The granulations not yielding to silver, they were cauterized to-day with a saturated solution of chromic acid. There is no discharge from meatus ; its walls have returned to a normal condition. The *membrana tympani* appears thickened and is still injected ; no perforation visible. With the catheter, the tube is found wide open, no râles or perforating sound audible.

June 1*st*.—The granulations have yielded nicely to the chromic acid ; their discharge is very much less. The inner end of cotton pellet in meatus impregnated with fetid pus. The catheter was used daily with same result, no râles or perforation audible. No fistula can be seen in upper wall of meatus or in *membrana flaccida*.

June 10*th*.—A conical nail 2 *cm* long was inserted.

June 13th.—Since the application of the nail the discharge has diminished very much ; the nail was reduced 2 *mm.*

June 18th.—The nail again reduced in size.

July 13th.—The nail bed still 2 *cm* long, granulations sluggish ; no tendency to contract after the nail had been removed for a few minutes. The nail was removed and pure sulphuric acid applied to its bed with a cotton holder.

July 14th.—Secretion has not increased by the application of sulphuric acid. Nail bed very much contracted ; cotton holder still shows a depth of 2 *cm ;* it was swabbed out well with 5-per-cent. solution of carbolic acid, covered externally with sublimated gauze and spring. During the month patient was attended to, in this manner, every other day. The discharge from the fistula exceedingly small, but yet a fine probe could be introduced to a depth of 1 to 1½ *cm.*

August 1st.—The fistula in mastoid has closed entirely ; it was covered with a piece of court-plaster.

August 5th.—Fistula remained closed, no signs of retention of pus nor pain upon pressure. *Mt* is thickened and slightly red $h = \frac{c}{5}$. Patient dismissed.

CASE 26.—**Acute Catarrhal Inflammation of the Right Middle Ear, Ending in Purulent Form with Incarceration of Pus in an Eburneated Mastoid; Operation; Cure in Less Than Three Months.**

De K——, male, twenty-two years old, from New York ; consulted me May 5, 1887, for otalgia of right side, which began two weeks previous, and for which he had been treated by a physician without relief.

Status præsens : Right side ; auricle and meatus normal. *Memb. tympani* evenly injected, copper-colored, no visible signs of exudation in middle ear. Mastoid region normal, no pain upon pressure. $h = \frac{c}{5}$. With catheter I found the *tuba* open, no râles, infiltration produces no improvement of hearing. For the last two weeks his sleep has been interrupted by sudden pains in the head, chiefly in the occipital and temporal regions. Moist dressing applied.

May 9th.—He has been treated daily with inflation of middle ear and Priessnitz' compress. He has had very severe pain during the nights, but was relieved during the day. The early part of last night the pain was very severe, but passed away after the ear began to discharge.

May 14th.—He has been treated daily with inflations, injections of carbolized water and Priessnitz. Upon syringing, the fluid passes freely into the nose. The discharge is very copious and entirely purulent, necessitating the frequent change of the cotton pellets.

May 30th.—Same treatment daily. He has had more or less pain during the night, but none during the day. Discharge unchanged. The mastoid region does not show any signs of inflammation, but is painful upon pressure. The meatus is perfectly normal, *memb. tympani* is injected, with a pulsating perforation in its lower anterior segment. Schwartze's nitrate of silver treatment was used, but being followed by increased pain and suppuration, was not tried a second time.

May 30th to *June 6th.*—He became very much worse, the discharge being so copious that he had to be treated twice a day. The pain had also increased; he complained of continual headaches day and night, spells of shooting pains. He had slight fever; his tongue was coated; he had no appetite: complexion yellowish.

June 6th.—Operation in German hospital, Dr. Morse assisting. The soft parts covering mastoid normal; incision 1 *cm* from and parallel with posterior insertion of auricle, 5 to 6 *cm* long; periosteum normal, well attached to the bone, external plate normal; emissary canals well defined, *spina supra meatum* very prominent. I began to chisel in spot of selection, and after penetrating 1½ *cm* through dense, healthy bone I came to a few drops of pus. The external opening was enlarged to 1½ *cm* and then the scoop used until a depth of 2 *cm* was reached. Upon syringing, slight communication existed. Dressed as usual, packing the wound with iodoform gauze; antiseptic dressing. In the evening, temperature 38° C.

June 7th.—Temperature 37°. He had very little pain and slept part of the night. The bandage soaked with dry blood. Very little discharge on cotton pellet in the meatus. The gauze in the wound was firmly adherent and therefore not disturbed, but was well saturated with carbolized water by syringing.

June 8th.—Last evening temperature 38°, this morning 37° C. Patient feels and looks much better. He was able to go into the garden. Renewed bandage and a portion of the gauze in the mastoid. No discharge from the meatus.

June 12th.—He has been treated daily at hospital; to-day he

calls at my office for the first time, to be treated as an out-door patient. The wound begins to granulate and there is very little discharge from the mastoid, none from the meatus.

June 16th.—No discharge from the meatus since June 8th; *memb. tymp.* appears dull red; $h = \frac{0.07}{5}$. The external wound closing rapidly, but no signs of granulations in the bone, the cavity packed with iodoform gauze, covered with sublimated gauze held by a headspring.

June 24th.—The granulations in the cavity of the bone are forming slowly; they are stimulated by cauterization with a solution of nitrate of silver.

June 27th.—The granulations in the cavity have formed nicely, but several denuded spots can still be felt. Same treatment daily.

July 4th.—The external wound, as well as the cavity, almost totally filled with fungous granulations, bleeding freely at slightest touch. Applied a conical nail 2 *cm* long.

July 5th.—The nail has reduced suppuration and formed a nice bed for itself. Syringed with carbolized water. $h = \frac{0.20}{5}$.

July 6th.—The nail bed $1\frac{1}{3}$ *cm* deep, contracts readily when the nail has been left out a few minutes; for this reason the nail was removed.

July 9th.—The discharge has again increased very much; after cauterizing with nitrate of silver the nail was reinserted.

July 13th.—The nail bed again 2 *cm* deep. Patient being very desirous of going home, another attempt was made to leave the nail out.

July 16th.—Almost no discharge; the fistula has contracted so that only with a fine probe can I penetrate $1\frac{1}{2}$ *cm*. Daily swabbing with 5 % carbolized solution by means of cotton holder.

July 21st.—Fistula entirely closed; linear scar with almost no depression of external plate, no special pain upon pressure. Dismissed and leaves for Washington.

December 3d.—I have received several letters from patient stating that his ear is in perfect condition.

CASE 27.—**Chronic Purulent Inflammation of the Right Middle Ear with Total Destruction of Memb. Tympani; Caries Mastoidei with Abscess; Spontaneous Perforation of External Plate; Large Subperiosteal Abscess; Operation; Communication; Cure in Seven Months.**

Alfred K——, male, twelve years old, first seen July 20th, 1886. I find in my Case-book: "When one year old patient had

an abscess behind the right ear, but positively without any discharge from meatus. The abscess was opened and treated by Dr. Tolandsen. At present a funnel shaped depression over right mastoid, *memb. tympani* irregular and very much thickened. Fetid purulent discharge from left side, *memb. tympani* almost entirely destroyed, only the *membrana Shrapnelli* existing. In the inner portion of meatus a large granular polypus starting from lower part of middle ear." He was treated regularly in the office during the following ten days in August, at an average of every second day, to the 16th, when the suppuration had ceased entirely and no traces of the polypus were left. On the 31st of August he was seen again, and being perfectly well, was dismissed. During this period the treatment consisted of injections with carbolized water; the bulk of the polypus was removed with the cold snare, the remnants by cauterizations, either with nitrate of silver or with chromic acid.

June 1st, 1887, he called again with a relapse of the suppuration on left side; after cleansing and drying there were no signs of granulations, the walls of the middle ear as far as visible being covered with a shining serous-like lining; no denuded bone felt by probing. This aroused my suspicions as to the source of the profuse discharge, and though the mastoid region seemed perfectly normal externally, I cautioned the mother to attend the case carefully, since probably the bone was affected.

June 22d, he was brought to me with his head all bundled up in shawls, and the mother gave me the following information: She attended to the boy's ear as directed. On June 18th he felt sick at the stomach and vomited several times; at the same time he complained of headache and pain behind the ear. At first the family physician treated him for indigestion, but his attention being called to the ear, and finding some swelling, he ordered poultices.

Status præsens: The left auricle is swollen and stands out; behind this is a large fluctuating abscess ready to break, occupying the whole mastoid region and extending backwards into the occipital region. The skin covering the abscess is of purple color. From the meatus flows fetid, yellow pus. The walls of the meatus are somewhat swollen. The boy's general health has been very bad lately, he has lost flesh and bears upon his face the signs of great suffering. I opened the abscess at once by an incision 3 to 4 *cm* in length, emptying about three tablespoonfuls

of fetid, yellow pus, mixed with caseous masses. Then, by syringing profusely with carbolized water, more caseous substance was removed. By probing, the surface of the bone felt rough, but no fistula could be found, nor was any communication with the meatus noticed. A drainage tube was inserted and an antiseptic dressing applied.

June 23d.—He slept well last night and feels much better to-day. The discharge has diminished greatly. The bandage is partly saturated with blood. Syringed with carbolized water. The operation was postponed until June 30th, so as to allow the boy to gain strength.

June 30th.—Syringed and dressed daily; boy sent to the German hospital where his head was disenfected and the temporal region shaved.

Operation: Dr. Morse assisting. Incision 3 to 4 *cm* long through the infiltrated integuments. The surface of the bone is exceedingly white, and at the spot of selection there are some fungous granulations. Probing through this granular substance I could penetrate into the bone. I began to chisel around this fistula, making an external opening of 1 *cm* in diameter, I scooped out a great quantity of cheesy substance, penetrating about $2\frac{1}{2}$ *cm*. There was considerable hemorrhage from the bone substance. In syringing, very free communication was obtained. The cavity in the bone filling with blood as rapidly as it could be sponged out, and though the hemorrhage ceased after using compression with a sponge, the cavity was filled with a clot of blood. This was left undisturbed, iodoform sprinkled on the wound and usual antiseptic bandage applied.

July 1st.—Patient slept well all night; the bandage found saturated with blood, it was renewed. The opening in the bone still filled with coagulated blood which was left undisturbed to avoid hemorrhage. The cotton pellet in the meatus is somewhat impregnated with pus and blood. No fever. He leaves the hospital.

July 2d.—He came to the office for treatment; the ear and the mastoid in same condition. Same treatment without any especial change until

July 8th.—For the first time after the operation, in syringing through the meatus, complete communication with the mastoid is obtained. The mastoid is granulating nicely, consequently suppuration has increased.

July 9th.—I adapted a conical lead nail 33 *mm* long, held by a headspring.

July 7th.—He has been attended to daily; as early as the 14th there was no discharge in the meatus. To-day, for the first time, he became very dizzy when I syringed, and after recovering from this, also when the nail was introduced. The nail was then shortened 3 *mm.* In syringing, which had to be done very cautiously, the communication was at times interrupted; at times again it was perfectly free. The amount of discharge was exceedingly small, but had a peculiar putrefactive odor. I often tried to detect some necrosed portion of the bone by probing, but never succeeded. This condition lasted during the whole of August, during which month he was treated daily with large injections of carbolized water, and the nail bed was occasionally cauterized, whenever communication was not very free.

September 3d.—The nail was reduced from 2½ to 2 *cm* in length, as the discharge was now scanty and no longer fetid.

September 9th.—No discharge; no communication in syringing.

September 12th.—Some discharge in the meatus; the nail-bed was cauterized with nitrate of silver.

September 13th.—Communication re-established and aluminium nail 2½ *cm* long adapted.

November 1st.—During October the case has been attended to daily communication maintained. Large quantities of carbolized water pumped through either by my assistant, Dr. E. S. Clark, or by myself. The aluminium nail was dispensed with, and replaced by a lead nail 1½ *cm* long.

November 7th.—No more communication with middle ear and no more discharge in the meatus. After syringing with the usual carbolic solution, the nail-bed was swabbed with 5-per-cent. solution of carbolic acid. The walls of middle ear covered with a fine smooth membrane.

November 15th.—Nail removed permanently. The fistula, after cleansing, covered with sublimated gauze.

December 23d.—He has been attended to three times a week; the fistula has contracted but still a fine probe can be introduced 1½ *cm.* In 56 hours hardly one drop of pus on the gauze. The fistula was swabbed with 5 % solution of carbolic acid. This treatment had to be continued twice and three times a week until January 28th, when no more traces of the fistula being found, he was dismissed cured, there being but a very slight depression on the mastoid.

CASE 28.—**Chronic Purulent Inflammation of Both Middle Ears with Caries and Abscess of the Right Mastoid; Operation; Cure of Mastoid Affection in About Four Months, Leaving Some Otorrhœa.**

Willie S——, male, four years old, called April 8, 1887, with chronic otorrhœa. When two years old the boy could hear and articulate plainly; then both ears began to discharge. He was taken to an aurist in this city and treated by him daily at his office; the treatment consisted of blowing powder into the ears, often without previously examining or syringing them, and occasional inflations by Politzer's method. The child became very much worse, and lost speech for several months.

Status præsens: Copious, fetid, purulent discharge from both ears. Meatus as well as mastoid regions normal. Condition of *memb. tympani* was not noted. He speaks so indistinctly that he is understood by his mother only. I ordered the ears to be syringed twice daily with tepid water and then instillations of a 2 per-cent. solution of Calvert's No. 1 Carbolic Acid. The parents became convinced by July that they could not succeed and, as originally advised, brought the child to me for daily treatment. During July I treated the child daily by inflations with Politzer and thorough syringing with carbolized solution. This was of no benefit whatever; the general health of the child was getting worse, he was restless at night, mastoid region on left side, though of normal appearance, was sensitive to touch; discharge from both ears, but more so from the left, which had increased and was exceedingly fetid.

July 28th.—Operation on left side, at the German hospital. Ether narcosis. Head disinfected and temporal region shaved. Incision through normal tissues to the bone, periosteum firmly attached to external plate which was normal. I began the operation with chisel and mallet, and at a depth of 5 *mm* I found pus. After sufficiently enlarging the external orifice, the scoops were used to evacuate the cheesy substance and pus contained in mastoid. In syringing, free communication existed. Dressed with carbolized gauze and antiseptic bandage. One half hour after the operation the child, wrapped up in blankets, was removed to his residence, a few blocks from the hospital.

July 29th.—I called at the house and found the boy running about. A marked improvement was noticed in his complexion, he slept well all night and never complained of pain. The band-

age was partly saturated with blood ; it was removed. Scarcely any discharge from meatus, the cotton pellet being only partly impregnated. The gauze in the wound firmly adherent as usual, was left ; syringed with carbolized water and antiseptic bandage applied.

July 30th.—Same condition and treatment as yesterday. The child is to be brought to my office and treated as an out-door patient. During the following five months he was treated daily. A few days after the operation the mastoid began to granulate nicely. Communication existed constantly ; when slightly obstructed the necessitating the insertion of a lead nail 2 *cm* long early in August nail-bed was cauterized with pure nitrate of silver. The discharge from middle ear never disappeared entirely, but lost its fetid odor. *Membrana Tympani* was entirely destroyed, the *membrana Shrapnelli* and the somewhat shortened handle of malleus still present. November 7th, the cutis covering the mastoid becoming very much inflamed and painful, so that the nail could only be introduced with difficulty, I decided to remove the latter entirely. The fistula in mastoid closed very rapidly, the inflammation of the skin, probably was only caused by irritation of the nail, subsided, and only a slight depression of the external plate and a linear scar remained. The discharge from the middle ear was scanty, muco-purulent and not fetid, the cotton pellet left in position for forty hours would show only traces of pus. In December he was seen daily, chiefly for observation ; finding every thing satisfactory he was allowed to be removed to Garden City, Oregon. The mother had become experienced in using Politzer's method, and in syringing the ear ; provided with all the necessaries, she promised to carry out the treatment, daily using carbolized water for the syringing. The right ear had also been treated ; the condition of *memb. tympani* was alike in both ears, no granulations having ever been observed. The discharge decreased, lost its fetid odor when daily syringed, but became so when neglected for forty-eight hours—this being done occasionally for experiment.

July 2d, 1888.—The child was brought down again for inspection, and because the discharge from the right ear had increased. The left ear also suppurates more, the pus being very dark and fetid ; mastoid in good condition. I treated the child ten days, during which period he improved so rapidly, that he was allowed to return home July 19th. He speaks a little more indistinctly. Watch of 5 *m* hearing distance is not positively heard upon pres-

sure either on meatus or mastoid, both sides being equal. This patient will figure again as Case No. 44 of the series of 1888 for operation on the right side.

This case will furnish the enemies of the boracic acid treatment another instance in support of their opposition. Without considering the pros and contras in the use of Bezold's remedy, I cannot help accusing of ignorance or negligence any specialist who will treat a purulent otorrhœa merely by inflating and filling the meatus daily with the powder, often even without convincing himself of the condition of affairs. This certainly was never done by Bezold, without previously carefully examining the condition of the powder remaining in the inner portion of the meatus. Similar treatment was applied by the same specialist in Case No. 12 of my first series (These ARCHIVES, XVII., p. 308, etc.) which ended in caries of mastoid.

CASE 29.—**Acute Purulent Inflammation of the Right Middle Ear; Empyema Mastoidei; Operation; No Communication; Cure in Five Months.**

A. A——, male, thirty-five years old, called at my office July 29, 1887, having severe pain in the right ear, which had begun one week before. I found the *membrani tympani* inflamed and bulged outward. I performed paracentesis at once, emptying a considerable amount of pus. After syringing with carbolized water, Priessnitz was applied.

July 30th.—He had a fair night, without any pain. There was a very profuse purulent discharge. Inflation proving that the perforation was very small, I enlarged the same. In syringing, the fluid then passed through the nose freely. The same treatment was carried on once a day, without any marked change, until August 4th, when the discharge increased so much that the ear had to be dressed twice a day. From August 4th to the 19th, the perforation had to be enlarged several times; he was treated twice a day; he complained repeatedly of having pain during the night. The mastoid region became sensitive to the touch, though not swollen; the walls of the meatus were normal.

August 19th.—Patient is very much discouraged, feels very weak, his appetite is poor, his tongue coated, his complexion yel-

lowish, he has slight fever. He was sent to the German hospital, and prepared to be operated upon the following day.

August 20th.—Operation: Section in ordinary way through the normal external integuments. Periosteum was adherent, and was pushed aside; external surface of the bone normal. *Spina supra meatum*, as well as the canals for emissary veins, well marked. After penetrating with the chisel through a hard external plate 5 or 6 *mm* in thickness, I reached a soft dark-red substance, the degenerated swollen mucous membrane, in two air cells of medium size. These were scooped out, and, penetrating still deeper, I found a cavity containing thick yellow pus. In probing, I found this cavity to be very large, and to extend so far backwards that I feared the sinus might already have become exposed. The cavity was scooped out very carefully, no pressure being used, and was afterwards irrigated thoroughly. When patient had almost recovered from the narcosis, a forced injection through the meatus was tried, but no communication was obtained. Finally, the cavity was again carefully syringed with a stronger solution of carbolic acid, and packed with iodoform gauze; antiseptic dressing.

August 21st.—The dressing was renewed by the house surgeon without my consent. Patient had neither pain nor fever. His complexion is whiter.

August 24th.—He has been treated in the hospital daily. Forty-eight hours after the operation he was allowed to get up. The discharge from the middle ear has ceased entirely. To-day he came to my office to have his wound dressed.

August 30th.—The cavity is almost entirely filled by granulations, and the external opening is getting so clogged by the same, that a conical lead nail $2\frac{1}{4}$ *cm* long had to be inserted.

September 5th.—All through August he has been treated daily; there has not been much change, and communication has never been obtained. Yesterday he had some pain in the ear, and, for the first time, some discharge was found in the meatus. The *membrana tympani* is thickened and injected in its upper part and along the handle, but no perforation is visible nor detected upon inflation. In the nail-bed, at a depth of $2\frac{1}{2}$ *cm*, a rough spot in the bone can be felt. The granulations bleed easily.

September 9th.—No discharge in the meatus since yesterday; the nail was shortened 3 *mm*.

October 1st.—During the month of September he has been treated daily. The last few days the skin covering the mastoid had

become inflamed and painful; the nail was, therefore, removed; to-day, after cauterizing the nail-bed with nitrate of silver, it was filled with iodoform gauze. These cauterizations were used three times this last week; on other days, daily swabbing with a 5-per-cent. solution of carbolic acid.

October 7th.—There is hardly any suppuration from the mastoid; the fistula is very much contracted.

October 14th.—The fistula has been cleansed daily with 5-per-cent. solution of carbolic acid. To-day it is almost closed; with a very fine probe I can still penetrate 1½ *cm.*

October 27th.—During the month of October up to the 18th, he was treated every other day, the fistula being cauterized several times, as already stated. To-day the fistula is entirely closed, no opening being found at all with a fine probe. It was covered with court-plaster, and patient dismissed.

January 4th, 1888.—He has had no more trouble; the *membrana tympani* is somewhat thickened; $h = \frac{1}{5}$. The linear scar on mastoid has a slight depression in its centre.

CASE 30.—**Pistol Wound of the Right Ear Producing Cicatricial Closure of Cartilaginous Portion of the External Meatus and Displacement of Auricle; Caries of Mastoid; Operation; Cure with Permanent Fistula Replacing the External Meatus; Extirpation of a Large Portion of Maxilla Inferior with Satisfactory Results.**

George M——, male, in the thirties, shot himself with a revolver behind the ear, February 11, 1887, with suicidal intent. He was taken to the City Receiving Hospital by the police, treated, and operated upon March 3d; pieces of the bullet were removed. May 28th he was admitted to the German Hospital, operated by Dr. Morse June 4th, necrotic pieces of the upper maxilla being removed. Shortly after this last operation Dr. Morse requested me to see the patient; I found him in the following condition: Right auricle inclined backwards, almost horizontal, and contracted by complete cicatricial closure of the external meatus; in front of the tragus and at posterior insertion of the auricle are scars from previous operations. The meatus is entirely closed, forming an irregular slit, in the lower part of which a fine probe can be introduced 1½ *cm* in an upward and forward direction. In raising the auricle the posterior surface of which is in close contact with surface of mastoid, I find at its posterior insertion an

irregular cicatrix with a fistulous opening clogged with granulations in its centre. Pus is continually oozing from this and keeping the parts moist and raw. A probe introduced in the fistula takes the same course as the one in the meatus; but the two do not come in contact. No caries of the bone is detected.

Our intention was to separate the auricle entirely, to try to obtain communication with the external orifice of the meatus, and, answering to the patient's wishes, to give the auricle a better position.

July 22d.—Dr. J. Morse operated, I assisted. The first incision parallel to the insertion of the auricle was, like this, almost horizontal; all attachments were divided, and the auricle became perfectly movable. The irregular scar was excised by two other incisions running from each end of first incision and meeting downwards and backwards. Thus a triangular piece was removed, with the base at insertion of auricle and apex downward. In probing the external meatus, I found I had communication with its inner portion, and proposed to keep it open during the healing process of the wound, and later on gradually dilate it mechanically. It was therefore packed with iodoform gauze, and the doctor then applied stitches to bring the auricle into a more normal position. This was done by holding it in position and stitching the corresponding points, endeavoring to use traction upwards. The primary result was beautiful: the auricle was very much improved in position, the patient being no longer ashamed to keep it uncovered.

My efforts, however, failed to keep the external meatus open. This was attempted the first few days with iodoform gauze, then with a piece of a French soft rubber catheter, and finally with a lead nail. The wound healed, with the exception of its lower portion, from which some dark purulent discharge oozed out. Upon inflation, no air escaped through the posterior fistula, though the meatus was entirely closed. Patient complained continually of severe pain in his head, especially when eating. He threatened to take his life unless another operation were performed. I suspected the mastoid to be affected, especially as in probing some denuded bone could now be felt.

August 25th.—Mastoid operation; Dr. Morse assisting. Incision in usual manner running through the fistula, and soft parts. The granulations at orifice of fistula were first scooped out, and this was then enlarged with a chisel. The mastoid was found full

of granulations, which were thoroughly scooped out, producing considerable hemorrhage. I had penetrated 3 *cm*, until finding hard bone substance, I desisted from further procedure. The cavity was irrigated well and packed with idoform gauze. He was treated daily in usual manner, and the discharge ceased immediately.

September 4th.—A conical lead nail 2½ *cm* long was applied. The nail had an unusual course, running forward and upward, and was kept in place by a linen tape.

September 16th.—Discharge very slight ; nail reduced to 2 *cm* in length.

October 9th.—The nail could not well be kept in position ; it became troublesome by constantly falling out, and was replaced by a piece of French soft rubber catheter. Suppuration was very slight, becomes very fetid if not attended in forty-eight hours. To-day the external orifice is 6–7 *mm* in diameter, gradually decreasing while running upwards and curving in towards the osseous portion of the meatus. The walls of the fistula have no tendency to contract, are smooth as if covered with epidermis, and no rough places nor granulations can be detected by probing. In this condition patient left the hospital, perfectly satisfied.

February 14th.—He called on me, and was very much depressed mentally. He has not felt perfectly well since he left the hospital. A few days ago a swelling was noticed in front of the right ear, which opened spontaneously under the lobulus, emptying very fetid pus. He has pain in that ear almost every night, and is very much annoyed by the continuous noises in his head. I found under the lobulus, below the fistula in the mastoid, which was kept open by the piece of catheter, a second opening 1½ *cm* distant from the first, from which very fetid pus oozed. He was at once sent to the hospital to consult Dr. Morse ; the latter diagnosed caries and necrosis of maxilla inferior.

On February 17th, a large portion of the right inferior maxilla was removed by Dr. Morse. A few weeks later the patient was discharged cured. Careful examination during the narcosis showed that the fistula in the mastoid had taken the place of the external meatus ; this was arrived at by calculation, as inspection was not possible. This fistula communicated with the osseous portion of the meatus near the insertion of the *membrana tympani*, which was either destroyed or had a large perforation. In injecting a solution of chloride of sodium with the catheter for experi-

ment, the fluid, and also, upon inflation, the air, passed so freely through the fistula, that I was led to suppose that no *membrana tympani* existed, or, if present, had a very large perforation.

Case 31.—Chronic Purulent Inflammation of the Right Middle Ear with Acute Relapses and Formation of Subperiosteal Abscesses by Gravitation; Caries of the Mastoid; Operation; No Communication; Cure in Three Months.

Lily B——, female, aged eighteen, from Los Angeles, Cal., consulted me October 2, 1887. She was brought to my office directly from the train, her head enveloped in shawls. The right side of her face and head is very much swollen, with œdema of lids and conjunctiva. The right auricle is standing almost at right angles. On right mastoid is a large swelling of purple color, including the whole region of the mastoid and extending upwards over the auricle, also into the occipital region. The meatus is moist with fetid pus, its walls swollen, thus preventing inspection of *membrana tympani*. I made an incision 1½ *cm* long, emptying three to four tablespoonfuls of decomposed pus. Syringed with carbolized water, introduced a drainage-tube, and applied a bandage.

October 3d.—She had a good night, no pain, no fever, the discharge very much reduced. The œdema of lids has receded. Treated in same manner and allowed patient to get up.

October 4th.—Same condition and treatment. She gave the following history: When a child she often complained of earache. Two years ago, after a horseback ride, she had severe earache on the right side which lasted all night, and was followed by a discharge. In a few days the discharge ceased almost entirely, but was noticed again whenever she had a cold and earache. Twice since the first attack the earache was followed by an abscess behind the ear, which was lanced each time and healed rapidly. The present abscess was much larger than the previous ones, and she suffered much more. She did not have it lanced because the attending physician proposed opening the bone.

October 5th; Operation, Dr. de Vecchi assisting. She complains of distress in the cardiac region. As soon as the narcosis was begun she vomited immense quantities of undigested food remaining from the supper of the evening before. Considerable time was lost in disinfecting and shaving. The incision through the infiltrated tissues, which were 2 to 3 *cm* thick, was followed by

profuse parenchymatous hemorrhage. The periosteum was detached from the bone. The surface of external plate was rough but not discolored, and no fistula could be detected. The *spina supra meatum*, as well as the openings for emissary vessels, were well marked. I began to chisel the external plate, which was about 3 *mm* thick ; pus oozed out freely. The external opening was properly enlarged ; then the scoop was resorted to, and the mastoid which was transformed into an abscess filled with pus, cheesy substance, and granulations, was thoroughly scooped out to a depth of almost 3 *cm* in the bone itself. As soon as patient recovered from the narcosis, a forced injection was tried, but no communication existed. As usual, the cavity was filled with iodoform gauze and bandaged antiseptically.

October 6th.—Patient slept well, but still complained of distress in the stomach. I regulated the diet. The bandage is dry but stained with blood. The wound is in good condition, and the swelling of the soft tissues very much reduced. The opening in the bone presents a good appearance. The swelling of the meatus is also very much less. There is no purulent discharge either from the mastoid or the meatus. No fever. After carefully syringing with carbolized water, whereby no communication was obtained, dressed with iodoform gauze as usual. Patient will remain in bed.

October 7th.—Same condition as yesterday, but with less swelling of soft parts. Same treatment.

October 8th.—She called at my office for treatment. No change.

October 9th.—Very slight suppuration from the mastoid, but none from the meatus, external plate is pink in color. In syringing no communication obtained.

October 14th.—She has been treated daily. The soft tissues are granulating very rapidly, and are now 1 *cm* thick. The lumen of external meatus is now normal, and the *membrana tympani* appears thickened and injected ; no perforation is visible. The opening in the mastoid is lined with granulations, and is now almost 2 *cm* deep. The discharge being scanty, the bandage is dispensed with, and the wound covered with sublimated gauze held by a spring.

October 17th.—She has been seen daily, and her general health is the very best. Depth of wound, including soft integuments, $2\frac{3}{4}$ *cm.* Meatus normal ; *memb. tympani* is getting pale ; $h = \frac{0.2}{5}$. Same treatment.

October 26th.—Conical lead nail $2\frac{3}{4}$ *cm* long inserted without difficulty.

October 27th.—Nail-bed smooth, scarcely any discharge.

October 29th, 10 A.M.—She had earache during the night. The soft integuments covering the mastoid and the posterior surface of the auricle are œdematous. The upper wall of the meatus is also very much swollen. Finding no special reason for this condition, I presumed that the nail was too long, and that perhaps the strong spring produced too much pressure. Therefore I changed the nail for a shorter one and applied a weaker spring. At 4 P.M. she called again very much alarmed about pain in the mastoid; this was produced by displacement of the nail and spring. She was cautioned to be less lively and to be careful not to displace the spring.

October 30th.—She had no more pain, the œdema having almost entirely subsided.

November 15th.—The same treatment daily; no further complications. The nail has been gradually reduced in length and size, the fistula cleansed daily with a 5 % solution of carbolic acid. To-day the nail-bed still measured almost $1\frac{1}{2}$ *cm.* In order to accelerate the healing it was carefully scraped with a sharp scoop, and the nail reinserted immediately.

November 20th.—The nail-bed is $1\frac{1}{4}$ *cm* deep, but very much contracted; no discharge. The thin nail, still 1 *cm* long, was removed.

November 26th.—$h = 0{,}\frac{4}{5}$. A fine probe can still be introduced $1\frac{1}{2}$ *cm.* Meatus normal. During the last few days, there being no discharge whatever, the spring was removed and the fistulous opening covered with plaster.

December 1st.—No further trace of the fistula. On mastoid a depressed linear cicatrix is present.

November, 1888.—Patient has been seen several times since, and has had no more trouble.

According to the history of the case one would suppose that the otorrhœa which began two years previously never healed, but that it became chronic with acute relapses upon three occasions. Also that during the time the mastoid became implicated, spontaneous perforation of the external plate followed, with formation of subperiosteal abscesses. After the abscess was opened, the fistula in the bone would become clogged by granulations, thus apparently remaining well until the next acute relapse of the otorrhœa. Such cases are very frequent, especially in children; and I thought

I was dealing with such a case. I was therefore very much astonished when I found the external plate without the least trace of an existing or a previous fistula. No doubt in this case, as well as in some of those already published in these ARCHIVES, the pus followed the posterior wall of the meatus, separating the skin from the periosteum and forming an abscess on the mastoid, the nearest large surface where the periosteum could be detached. Naturally, it remains undecided, whether or not a spontaneous perforation of the anterior surface of the mastoid, which is formed by the posterior wall of the meatus, took place, the pus then burrowing under the cutis and accumulating on the surface of the mastoid. Probably not, since after thoroughly scooping out all the decayed portion of the mastoid, no such communication was detected. In the after-treatment of this case the œdema produced by displacement or too strong pressure of the spring upon the nail is worthy of attention; whenever the nail is either too long or becomes displaced, this is followed by a redness and swelling of the soft integuments over the mastoid, often even with œdema of auricle and meatus. I must confess that before I was aware of this, I thought I had a case of incipient erysipelas before me. Therefore, in children, it is best to leave the nail out a couple of days and to replace it after all inflammatory symptoms have subsided. In adults the use of a smaller nail without much pressure from the headspring is all that is necessary to remove the swelling. If a larger nail is needed to keep up communication with the middle ear, several thorough and deep cauterizations with pure nitrate of silver should precede its insertion.

CASE 32.—**Acute Purulent Inflammation of the Right Middle Ear, with Thickened Membrana Tympani; Insufficient and Intermittent Perforation, Producing Retention of Pus; Mastoiditis with Eburneated Appendix; Operation; Doubtful Communication; Cure in Three Months.**

B——, male, aged sixty-four, sent from Oakland Sept. 30, 1887. He is a very large, powerful man; he was sitting in a chair when

I arrived, his head wrapped up in woollen cloths, his face wearing an expression of pain and weariness. He stated that about four weeks previous he had an earache on right side, probably from a cold he had at the same time. The physician whom he consulted ordered warm applications and drops for the ear. A second physician was consulted, who ordered syringing with large quantities of warm water and gave injections of morphia in the evening. There has never been much discharge from the ear, and lately none at all. The pain has continued steadily, at times with sharp shooting spells, and is much more intense during the night.

Status Præsens : Auricle and external meatus normal, no suppuration. *Memb. tympani* covered with dry epidermis. Mastoid region normal, somewhat painful to touch.

I applied a Priessnitz' compress and advised him to call at my office the next day for careful examination.

October 1st.—Came to the office as directed, stating that he had had a very bad night, suffering intense pain. I syringed the ear, removing a large quantity of macerated epidermis which had filled the innermost portion of the canal, covering the *memb. tympani.* After drying I found the *memb. tympani* dark red and bulging. I made a large paracentesis in the posterior half of the membrane ; pus oozed out at once. This was followed by inflation with Politzer, syringing, and application of Priessnitz.

October 2d.—He was not relieved by the puncture, having as much pain last night as the one previous. The pain began in the evening and continued all night ; he describes it as a deep-seated pain over the whole temporal region, and especially painful at the *tuber frontale.* The meatus is filled with thick pus, its walls are not swollen, and the mastoid region is normal, with no sensitiveness upon pressure. After inflation with Politzer, syringed with carbolized water and applied bandage. In case he had severe pain, he was advised to remove the bandage and have the ear filled repeatedly with warm water, and to apply an ice-bag to the side of the head.

October 3d.—He again had great pain during the night, and was only relieved as long as ice was kept on. Otherwise the condition of the ear remained the same. Same treatment.

October 5th.—He has the same trouble every night. No change has been noticed in the condition of the ear. Patient is worn out ; has lost flesh ; his complexion is pale yellow, and he desires to

be operated upon. He was sent to the German Hospital with proper directions for disinfection of the head and shaving of the temporal region.

October 6th; Operation.—Section through normal external integuments; periosteum attached, *spina supra meatum* not well defined and canals for emissary veins hardly perceptible. The prolongation of the *linea temporalis* was well marked; below this and close to the meatus was a noticeable depression. This spot was selected for opening, which was done with chisel and mallet. The external plate was exceedingly hard and compact, and 4 *mm* thick. At this depth small air cells were exposed; but the bone was still exceedingly hard until a depth of 1½ *cm* was reached. The bone substance, though still with but few air cells, became somewhat softer; with the chisel and scoop I penetrated to a little more than 2½ *cm*. There was slight hemorrhage from the inner portion of the bone, but neither degenerated mucous membrane nor pus was detected. The probe showing the bone to be very compact, I tried a forced injection through the meatus. In doing so the opening in the bone was well sponged and carefully watched by my assistant; he observed a few drops of pus oozing through the inner portion of the mastoid. This indicated that I was working in the proper direction and that the antrum would soon be reached. I continued with the scoop until a depth of 3 *cm* was reached, and though no antrum was observed, desisted from further interference. The mastoid and external meatus were packed with iodoform gauze and head bandaged as usual. Narcosis excellent; was semi-conscious during the latter part of the operation; felt very well the rest of the day.

October 7th.—Had considerable pain the first part of the night, and only felt relieved after taking three and a quarter teaspoonfuls of McMunn's elixir of opium. This morning he looks well, a great improvement in his appearance being already noticeable. No fever. The gauze filling the meatus hardly impregnated with pus; that filling the mastoid was removed. A forced injection was tried again; the fluid passed freely into the throat and nose, but no communication with the mastoid was detected. Dressed and bandaged in same manner. He felt very faint during the treatment. Ordered fluid food, ice-bag to the head, and one gramme of antipyrin three times a day.

October 8th.—About 11 o'clock at night pain began; the ice then feeling unpleasant, was discontinued. The pain ceased, and

he slept well after taking two half-teaspoonful doses of McMunn's elixir. No fever. The wound looks very well, and the surface of the bone appears slightly pink. There was more pus upon the gauze, filling the meatus and the mastoid to-day than on previous days. No communication in syringing. Same dressing. Solid food ; he will get up and exercise in the hall.

October 9th.—He felt very well all day and until midnight, when pain began ; this was relieved by half a teaspoonful of McMunn's. Amount of discharge about same as yesterday. I again tried to obtain communication, but did not succeed. To-day he leaves the hospital.

October 10th.—Twenty drops of opium at bedtime, followed by sound sleep all night. The muco-purulent discharge in the meatus has increased, but that in the mastoid has decreased. Again no communication obtained. *Memb. tymp.* appears red and thickened, perforation almost closed ; after using a twenty-per-cent. solution of cocaine it was enlarged downwards. Inflation with Politzer and dressing as usual. Antipyrin was discontinued.

October 11th.—No special change. Still some pain during the night. Same treatment. Had fifteen drops of opium.

October 12th.—He had considerable pain nearly all night. No opiates were given. To-day same amount of secretion. By forced injection very feeble communication was obtained. Same treatment.

October 13th.—Same condition as yesterday, except that by forced injections through the meatus somewhat better communication was obtained. He requested to be allowed to take the antipyrin again, as, though not relieving the pain, it lessened it.

October 14th.—He slept well until eleven at night, when, having pain, he took some elixir of opium and then rested well until morning. The discharge from meatus as well as from mastoid is very profuse. No communication was obtained to-day. The perforation in *memb. tymp.* being very small, was again enlarged after the use of cocaine. The soft parts are covered with fine granulations, but none have formed on the bone. The general health of the patient has improved very much ; he feels better now than at any time since the beginning of the ear trouble, his head being perfectly clear. This he attributes to the antipyrin, the use of which he will not discontinue.

October 15th.—He had great pain during the night, three doses of one-half teaspoonful each of the elixir failing to alleviate the

pain. This morning he feels easier, but does not look well. The discharge in the meatus has increased very much. The fistula in the bone was probed carefully, as usual, to try to find communication with the antrum. With a small, sharp scoop I attempted to scoop out the inner portions of the cavity, trying to obtain a better communication by the removal of small fragments of bone; this had to be done very carefully, as the opening was already 3 *cm* deep, and consequently I tried to work forwards more in the direction of the middle ear. No cavity was found, and no communication obtained in syringing. At 7 P.M. I went to Oakland to visit patient; he had had a very good day and anticipated a good night.

October 16th.—Had some pain during the night; this was relieved by the opiate.

October 18th.—On the 17th he had but little pain during the day, but at night it was continuous. Three half-teaspoonful doses of the elixir failed to relieve him.

October 19th.—He had only a little pain, and that at intervals; nevertheless, he slept well without an opiate. To-day there is less discharge from the meatus, but considerably more from the mastoid. No communication exists; forced injections are now avoided. Usual treatment.

October 20th.—Again a great deal of pain at night, not relieved by three half-teaspoonful doses of the elixir. Otherwise no change.

October 21st.—He had more or less pain yesterday afternoon, during the night, and this morning, but he slept without medicine. I found out that he attended to his business a few hours in the afternoon, and while there did not complain. He looks perfectly well. The cavity in the mastoid is almost entirely lined with sound granulations, but the discharge is still very profuse. A soft-rubber drainage-tube was applied.

October 22d.—I forbade the use of the opiate, and also, if possible, the antipyrin; in case of pain, I advised him to try the application of ice again.

October 23d.—He went to bed at 9 P.M. and slept very well until 1 A.M., when he was awakened by pain; he applied ice, but this failing to relieve, and suffering intensely, he had to take one half teaspoonful of the elixir; after this he slept until 9 A.M. No special change noticed.

October 24th.—Again an exceedingly bad night, the pain being at times worse than he had experienced before. He describes it

as a deep-seated, thumping pain, located in the occipital region, temple, and vertex. The discharge from mastoid and meatus still very profuse. In carefully sounding the mastoid no denuded bone was detected; the cavity is now only 1½ *cm* deep. I attempted to scoop out some of the granulations, but patient fainted and I desisted. I informed him that unless a very favorable change should soon take place I would be compelled to operate a second time.

October 25th.—During the night he rested better than at any time since the operation, and this without opiate. I would have doubted this if his general appearance had not been so favorable. The discharge about the same or perhaps a little less.

October 26th.—From the time he left my office until he went to bed he had some pain at intervals; however, he slept well without opiate. The fungous granulations externally were removed with the scissors; those in the fistula were cauterized with nitrate of silver.

October 27th.—Patient had slight pain during the day, but none at night, and slept well without opiate. There is undoubtedly less discharge from the meatus. Usual treatment.

October 28th.—He had some pain in temporal region only during the day; this increased at bedtime and compelled him to take one half-teaspoonful of the opiate, after which he slept soundly all night. The discharge from meatus and mastoid has decreased very much.

October 29th.—Again some pain during the day and at bedtime; this was relieved by two doses of half-teaspoonful of the elixir. The perforation in the *memb. tympani* being very small, it was again enlarged under cocaine. In doing this, thick pus escaped from the middle ear, proving that there was retention. As the soft-rubber drainage-tube in the mastoid would not stay in place, the fistula was cauterized thoroughly with nitrate of silver preparatory to the insertion of a nail.

October 30th.—The pain is now very slight; patient does not mention it unless asked. He has gained considerable flesh, his face looks bright and his complexion clear. The discharge from the middle ear is very profuse to-day; by inflation and inspection the perforation proved to be very free. After usual treatment, inserted a conical lead nail 2 *cm* long, held by a flannel roller bandage.

October 31st.—He had no pain, and slept well. Same amount of discharge. The nail was lost, having fallen out; a new one was applied, and held in place by a headspring.

November 1st.—The pain was again intense during the night, and he was relieved only after taking three spoonful doses of elixir. No special change noticed.

November 3d.—Yesterday and to-day he had no pain, and no opiate was required. Same treatment.

November 4th.—Two doses of the opiate had to be taken to relieve the pain. The discharge is decreasing daily.

November 11th.—Since the 4th, he has had scarcely any pain, and has not taken any opiate. The discharge from the mastoid has been decreasing perceptibly, and that from the middle ear is to-day muco-purulent. With the catheter, no râles heard. At the opening of the fistula, the granulations form so rapidly that they require frequent cauterization. The fistula is now 1 *cm* deep; it contracted so much after leaving the nail out for a few minutes that the nail was removed entirely.

November 14th.—Same treatment daily, with but little change. The discharge from middle ear still saturates the cotton filling the meatus. The fistula in mastoid is still 1 *cm* deep; it has been cauterized on different occasions, to keep the external opening free from fungous granulations, and is swabbed out daily with a 5 % solution of carbolic acid.

November 15th.—An application to the middle ear of a 4 % solution of nitrate of silver (after Schwartze) was tried to-day; otherwise usual treatment.

November 16th.—The consequence of yesterday's treatment is that the discharge from the middle ear has increased very much, and that patient suffered some pain during the night. After inflation and cleansing, I prescribed a saturated solution of boracic acid; this was to be syringed into the ear three or four times a day, then the ear was to be filled with the warm solution, and the latter was to be forced into the middle ear by pressure upon the tragus. An application was first tried in the office; the patient succeeded very well in forcing the fluid to run out of the nose. The fistula was contracted, so that only a fine probe can be introduced.

November 17th.—The discharge is very much reduced; he had no pain, and was advised to continue the same treatment.

November 20th.—He has used the boracic solution four times a day; has had sharp shooting pains at intervals. The fistula is almost closed; no secretion.

November 22d.—The discharge from the middle ear has in-

creased again, notwithstanding the applications (four times a day). Will continue the same treatment.

November 26th.—To-day, for the first time, no discharge whatever. The perforation in *memb. tymp.* small; air penetrates easily; no râles. With a fine probe I can still penetrate to the depth of 1 *cm* into the fistula.

In December, from 1st to 22d, he has been seen in the office every day; the boracic instillations were continued, though there was no more discharge. The fistula remains open, and is almost a capillary canal. Usually the sublimate gauze covering it is dry, but shows slight stains of pus in forty-eight hours, sometimes not until after a still longer period. The latter part of December the patient was seen four times; on the 25th the fistula had closed entirely. The *memb. tymp.* is pale, thickened, and has a perforation about the size of a pinhead in its posterior and lower segment. He was dismissed with directions to wear cotton in his ear for a few weeks.

During the month of January he called several times, partly from fear of getting worse again and partly to satisfy himself that the ear was in good condition. The perforation in the *memb. tymp.* closed entirely; $h = \frac{0.5}{5}$. On the mastoid is a linear scar, with no noticeable depression.

Case 33.—**Acute Purulent Inflammation of the Right Middle Ear; Empyema Mastoidei; Operation; No Communication; Cure in Eight Weeks.**—D., male, in the thirties, consulted me Nov. 2, 1887, with his head wrapped up in shawls, suffering intensely, and gave the following history.

Six weeks previously, he was attacked with severe earache on right side. Poultices were applied, the ear soon began to discharge, but instead of decreasing the pain became more intense daily. Ten days afterwards he consulted a specialist, was attended by the latter twice, and then went to a second one who treated him for two weeks. A few days ago some swelling was noticed behind the ear; during the last forty-eight hours it has increased to its present size.

Status Præsens: Patient is a tall, muscular man; has always been in good health; he is very much reduced, and his expression shows that he must have suffered intensely. His right auricle stands out almost at right angles; behind is a large diffuse swelling, involving the temporal and a portion of

the occipital regions, and extending downward to the neck. He inclines his head towards the left; he screams upon the least touch to the swelling. This swelling shows signs of fluctuation at the base of the mastoid; elsewhere it feels like a hard infiltration. The meatus is filled with purulent discharge, but its walls are normal. When pressure is used upon the softer part of the swelling, pus oozes out of the meatus in larger quantity. I sent him to the German Hospital at once, with directions for shaving and disinfecting.

November 3d, 8 A.M.; *Operation*:—Ether narcosis. The dense infiltration of the tissues preventing sufficient retraction for operation, the incision was made larger than usual. The parenchymatous hemorrhage was very profuse, and required compression with sponges for several minutes. The external integuments were very dense, yellow, as if infiltrated with pus, having a thickness of one *cm* at the temporal region and increasing towards the neck. The periosteum was detached from the bone; the latter was discolored, especially near the meatus. *Spina supra meatum* and emissary canals not visible; the *linea temporalis* was flat, broad, and running downwards in a curve; no bony fistula was found; no pus on the surface of the bone. On account of the abnormal shape of the bone, and the absence of the principal guiding points, I began chiselling close to and at the level of the superior wall of the external meatus, where the bone was most discolored; here the bone was soft, and the chisel had hardly penetrated 1 or 2 *mm* when pus began to ooze out. The bone being very soft the chisel was put aside and the external opening enlarged with conical scoops; the undermined portions were snipped off with the bone forceps and the edges smoothed with a broad gouge. Thus the mastoid was transformed into a large abscess, which was carefully scooped out; this was followed by considerable hemorrhage. Besides the pus, the bone substance was mushy, and even contained granulations. On account of profuse hemorrhage, irrigation was kept up during the whole operation. By forced injection into the meatus, no communication was obtained. The external orifice of the cavity was packed round and measured 2 *cm* in diameter. The cavity was well with iodoform gauze, and the bandage applied tighter than usual so as to produce pressure.

November 4th.—Patient slept well and was entirely free from pain. The bandage is impregnated with pus, but is dry. The

swelling is very much reduced, and is no longer sensitive to touch. No fever. The gauze filling the mastoid was not disturbed ; that in the meatus shows no signs of suppuration. He was allowed to get out of bed.

November 5th.—He feels perfectly well, and has no pain. The gauze in the meatus shows traces of pus ; that filling the mastoid was also removed and found impregnated with pus and blood. The wound was irrigated thoroughly ; no communication. Dressed in same manner.

November 6th.—Patient desires to go home. Swelling and inflammation have almost entirely subsided.

November 7th.—He called at the office ; general health improved.

November 11th.—Patient has been treated daily with injections of carbolic acid, inflations, and packing of the mastoid with iodoform gauze. There has always been some slight discharge in the meatus ; with the increase of granulations in the mastoid, suppuration is more profuse.

November 14th.—The large cavity is lined with apparently healthy granulations, and is at present one half of its original size. Some days the cotton pellet in the meatus bears signs of suppuration ; at times again it is perfectly dry. The *membrana tympani* is injected.

November 16th.—The cavity is filling rapidly with granulations. I inserted a soft rubber drainage-tube (a piece of a French soft, red rubber catheter), left off the bandage and held dressing on with a spring. Meatus dry ; some râles heard by catheterization.

November 19th.—The rubber drainage-tube was replaced by a conical lead nail 1 ½ *cm* long. Fistula swabbed out with a 5 % solution of carbolic acid. The meatus remains perfectly dry.

November 25th.—On the 20th and 22d, the nail was shortened somewhat ; the granulations being very pale, were cauterized.

November 26th.—There is some purulent discharge in the meatus and very much from the mastoid, probably the result of yesterday's cauterization.

November 28th.—No more discharge from the middle ear, and very little from the mastoid. The fistula looking very well, the nail was again shortened.

December 23d.—He has been treated daily ; the nail which was still 1¼ *cm* long has been lost ; the fistula was found almost entirely closed.

December 25th.—The fistula is now entirely closed, was covered

with a piece of court-plaster, and spring dispensed with. There is no discharge from the meatus, and but a few râles upon catheterization. *Memb. tymp.* has still a small perforation and appears moist.

December 31st.—Patient was treated on 27th and 29th. Mastoid completely cured; no pain upon pressure; some depression of cicatrix; perforation cured; *memb. tympani* slightly injected and thickened. Patient was dismissed and advised to wear cotton in the ear for several weeks.

Case 34.—Chronic Purulent Inflammation of the Left Middle Ear; Subperiosteal Abscess and Granulations; Sieve-like Perforation of the External Plate; Caries Mastoidei; Operation; Still under Treatment, One Year after the Operation.

H. W——, male, aged eleven, was brought to me by his mother on November 25, 1887. The child is poorly nourished and kept very dirty. Since babyhood the left ear discharged, the discharge being very profuse at times and always having a bad odor. The mother syringed the ear now and then, and once consulted a druggist who prescribed ear-drops; but she has never consulted a physician. A few days ago the child began to complain of pain in the left ear and at the same time a swelling was noticed behind the ear; the ear was covered with moist rags and bandaged with woollen cloths. The swelling increased daily, until finally she consulted Dr. H. Wagner, who referred her to me.

Status Præsens: The left auricle œdematous; ext. meatus almost closed by swelling of its walls, fetid purulent discharge oozing from it. Behind the ear, a purple swelling covering the whole region of the mastoid.

The child was sent to the German Hospital at once; he had a bath, a shampoo, his head was disinfected and shaved over left temporal and a part of occipital region.

November 26th; Operation 8 A.M.—On account of the great swelling, the incision was made larger than usual and nearer to the auricle. Beneath the infiltrated skin was a thick layer of purple, fungous granulations, and under this a large quantity of pus. These soft tissues were detached from the bone, being undermined 5 to 6 *cm* in every direction. The granulations were scooped off and the soft tissues held apart, thus exposing the external surface of the bone. This was marked at the base of mastoid by numerous

pinhole openings. Slight pressure with the director was sufficient to break through the external plate, pus escaping at once. This opening was enlarged with sharp scoops as far as undermined, leaving an external orifice 2 to 2½ *cm* in size. The mastoid was transformed into a cavity filled with decomposed cheesy substance. It was carefully scooped out until the walls felt hard; the hemorrhage was very slight. In syringing, very free communication was obtained. The mastoid was packed with iodoform gauze and bandaged.

November 27th.—No fever. Bandage saturated with blood, but dry. No discharge in meatus. The gauze in the bone was not disturbed; in part it was very much adherent to the external wound. Syringed with a 2½ % solution of carbolic acid.

November 28th.—The mother wishes to remove the boy to her home; there being no fever, permission was given. No discharge in the meatus. The gauze in the mastoid was all removed, though still very much adherent; this produced slight hemorrhage. The boy fainted during the treatment. In syringing, no communication was obtained.

November 29th.—Same condition as yesterday except that in syringing communication was again obtained.

December 12th.—The boy has been treated daily without incident. The bone is granulating nicely, and there has always been free communication. Twice the granulations were cauterized; today a conical lead nail 2½ *cm* long was applied, only 2 *cm* of which were really in the bone as a sublimate gauze cushion was placed under the external plate to prevent strong pressure. A spring held the dressing in position.

December 20th.—The nail soon formed a smooth bed for itself; no trouble was experienced until last night, when the boy complained all night of sore-throat and severe earache on the right side. I found acute follicular tonsillitis and acute inflammation of the right middle ear with serous, sanguinolent discharge. I applied a Priessnitz compress and prescribed a gargle.

December 21st.—He again had severe earache during the night: the large moist pad covering the auricle was found saturated with serous discharge. Same treatment. On left side nothing abnormal.

December 22d.—The boy was feverish and weak. I advised the mother to keep him at home until he felt better, and to syringe the ears with carbolized water without removing the nail on left side.

December 25th.—The patient was brought to my office, having

more pain in the right ear, but with very profuse serous, sanguinolent discharge. Inflating by Politzer, a loud whistling sound is heard. The cotton pellet in the left ear was saturated with dark, fetid pus, and on syringing through mastoid good communication was obtained.

January 30, 1888.—Treatment has been continued daily in same manner. The communication is always very free, even with the fountain syringe (irrigator) with little force. The cotton pellet in the meatus is always found impregnated with the same dark, fetid discharge, necessitating irrigation with large quantities of carbolized water. On the 27th, 28th, and 29th of last month, the nail-bed was cauterized thoroughly on account of the communication not being perfectly free. In syringing, great caution is necessary as the boy becomes dizzy even when no pressure is used ; on this account the irrigation was interrupted several times. The discharge from the right ear has become purulent and is dark and fetid.

February 5th.—He has been attended to daily ; the communication is kept very free by occasional cauterizations. The discharge from both ears has decreased considerably, but still remains dark and very fetid.

February 15th.—Every thing remains in about the same condition in spite of careful daily treatment either by my assistant, Dr. E. S. Clark, or by myself. The conical nail is 26 *mm* long ; the communication remains very free. To-day I discovered by probing, that beyond the inner end of the fistula a pocket extending backwards and upwards exists. This pocket was partly filled with granulations which bled freely when touched, and was certainly causing decomposition of pus by stagnation. The *membrana tympani* is totally destroyed, and the surface of the *cavum tympani* is lined with a serous-like membrane. The nail-bed runs, of course, towards the middle ear ; and when the nail is in and kept in position by the spring, its inner end can by inspection be noticed in the middle ear. The diverticulum, or fistula leading to the pocket, opens at about the middle and posterior surface of the nail-bed. When the nail is in position it prevents the escape of secretion, which then stagnates in the pocket. With nitrate of silver melted upon the end of a silver probe, this pocket was thoroughly cauterized, and a smaller nail was applied, the end of which did not reach as far as the fistula leading to the pocket.

March 4th.—The pocket has been cauterized every second or third day, and is now very shallow.

March 21st.—At present there are scarcely any traces of a pocket; the former longer nail has been used for several days. The discharge is scanty, but dark, and has a very repulsive odor. The right ear has also been treated daily; at times it has been free from discharge for several days; the discharge then recurs; there is no pain.

November 1st.—In order to avoid repeating many of the details which occur in every case, I will give a general report of what has occurred since. The child has been treated daily in usual manner. Whenever the communication was at all obstructed, cauterizations with nitrate of silver were used. In general, the discharge has been slight, but almost black and very fetid. Twice it ceased entirely; but still the cotton pellet, after remaining in the meatus for twenty-four hours, had the same odor. Then, for experiment and being anxious to get rid of the case, the lead nail was shortened so as to allow the inner end of its bed to close, so that gradually it could be removed entirely. Each time this was tried for a few days, the discharge became very copious, and I was compelled to cauterize the nail-bed again, to re-establish communication, and to reinsert a longer nail. In syringing, large quantitities of the fluid have always been used. Carbolic acid in 2½% as well as in 3% solution had no effect on the fetid odor of the discharge.

In October I received the first sample of creolin, and tried this drug at first in a 2% solution. After a very few trials, the fetid odor disappeared almost entirely. I will not say entirely, for probably some was hidden by the strong tarry odor of the drug. But used in this strength, the boy complained about strong burning pain in the ear lasting from one half to one hour after treatment; and besides, the external opening of the fistula and its surroundings appeared inflamed. A 1½% solution had almost the same effect; if used weaker than this, the fetid odor soon returned. Upon the introduction of sublimate as an antiseptic, I tried it in some cases of chronic otorrhœa in solutions of 1:5000 or even stronger; but I abandoned its use, finding that it changed the secretion, or certain parts of the same, into a white precipitate that would remain adherent to the parts in the middle ear. In cases with almost complete destruction of the *memb. tympani* and but little discharge, these precipitates could be observed on the second and third day after the injection. I then returned to carbolic solution, until

encouraged by Kretschmann's article (*Archiv für Ohrenheilkunde*, 26 Band, 2 Heft, Seite 103). I then decided to give the sublimate a new trial in combination with either tartaric or muriatic acid. Our case was treated from the latter part of October, with sublimate tartaric solution 1:2500; this has produced no evil effects; the discharge has decreased considerably, and its fetid odor has disappeared. Three months ago, I yielded to the mother's request to continue the treatment a little longer, hoping to avoid a second operation.

November 20th.—Very slight discharge, almost no odor. The nail he has been wearing is only 1½ *cm* long. The entire length of the fistula is 28 to 30 *mm*. As far as the nail reaches, the canal is small and also conical; but beyond this point it becomes wider and irregular. Thus an opportunity is given for stagnation of pus beyond the inner end of the nail. To remedy this, the nail-bed, and especially its inner constricted portion, was cauterized thoroughly with nitrate of silver melted upon the end of a probe.

November 21st.—A nail, 28 *mm* long, was applied without difficulty. Sublimate muriatic solution is now used.

November 22d.—Very little discharge, and this is only slightly fetid. Beyond the inner end of nail-bed is a recess, and this, as well as the nail-bed itself, was cauterized thoroughly with nitrate of silver.

December 6th.—Since November 22d the fistula has been cauterized daily with nitrate of silver. To-day it was scooped out with a small sharp scoop; I discovered that the bone in the upper wall of the fistula was denuded and rough.

(*To be continued.*)

REPORT ON THE PROGRESS OF OTOLOGY DURING THE SECOND HALF OF THE YEAR 1888.

I.—NORMAL AND PATHOLOGICAL ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE EAR AND NASO-PHARYNGEAL CAVITY.

By A. BARTH, Berlin.

Translated by Dr. Max Toeplitz, New York.

A.—ANATOMY.

a.—HEARING ORGAN.

1. Barth, A. On the representation of the membranous labyrinth in toto, with demonstration of specimens. Lecture delivered before the Physiological Society in Berlin, December 21, 1888.

2. Habermann, J. Contribution to the origin of cholesteatoma of the middle ear. *Arch. f. Ohrenheilk.*, vol. xxvii., p. 42.

3. Netter. Bacteriological investigations on acute otitis media. *Ann. des mal. de l'oreille et du larynx*, 1888, No. 10.

4. Rohrer, Fritz. On the pathogeny of bacteria in purulent affections of the ear. *Deutsche Med. Wochenschr.*, 1888, No. 44.

5. Rohrer, Fritz. Contribution to the morphology of the bacteria of the ear and naso-pharynx. With 5 colored plates. Zurich, 1889.

1. The author easily made beautiful and transparent specimens by imbuing the petrous bone, embedded in celloidin before decalcification, with a fatty material, viz.: common oil for large specimens and copal resin for smaller ones. After removal of the osseous frame the water is extracted from the specimens with absolute alcohol, and they are preserved in oil of origanum.

2. The petrous bone examined is taken from a man, twenty-one years of age, who had died of meningitis caused by a purulent otitis media, which had pierced the bone. While the outer anterior wall of the mastoid antrum was covered with numerous granulations, a cholesteatomatous mass, of the size of a pea, was found upon the posterior wall. A strip of epidermis, 2 to 3 *mm* wide, extended thence to the posterior margin of the handle of the malleus which, under the microscope, proved to be epidermis. In the posterior upper quadrant of the drum-membrane was a perforation, where the above-mentioned strip of epidermis passed directly into the outer integument. The author is convinced that the strip of epidermis, and subsequently the cholesteatoma, developed by the growing of the epidermis upon a spot where the mucous membrane had been destroyed by the processes of inflammation and suppuration. In the extremely thickened mucous membrane of the middle ear numerous cysts, which are probably to be considered as enlarged glands, were found at various places. In addition an atrophy of the cochlear nerve was found, which is explained as atrophy by disuse.

3. Acute otitis media is not an affection confined to narrow limits and always produced by the same microörganisms, but there are several kinds of inflammation, each one of which depends upon a separate infectious agent. Each kind has its characteristics, due to the peculiarities of the microbe to which it owes its origin. In the secretions of the acute otitis media the following four different species have been found up to date: (1) The streptococcus pyogenes. (2) Fraenkel's pneumococcus. (3) Friedlaender's microbe; and (4) the staphylococcus pyogenes.

a. Otitis media due to streptococcus is the most frequent and most severe form. It is frequently complicated with other symptoms owing their origin to the same microbe, among which the following are prominent: Abscesses of the skin, suppuration of the mastoid cells, purulent meningitis, phlebitis of the transverse sinus, and pyæmia.

b. Four entirely reliable observations prove the occurrence of Fraenkel's pneumococcus in the purulent discharges of otitis media (Zaufal, NETTER). The small number of cases does not indicate its rare occurrence in acute otitis media; on the contrary, Netter is sure of its frequent occurrence, especially in pneumonia and typhoid fever, where it takes the same fibro-

genous part as the microbe of pneumonia. This otitis is less severe than that due to the streptococcus, its course is rapid, leading to early perforation. Recovery takes place in a regular manner, but may be complicated with purulent meningitis.

c. Zaufal found in a single case Friedländer's pneumococcus, but it was not ascertained whether it was in this case the cause of the otitis media. Zaufal believes that this micrococcus is chiefly found in the severe cases of sero-sanguineous otitis media, which are almost invariably associated with severe complications.

d. Netter has found four times the staphylococcus aureus in the suppurations of otitis media, but never alone ; it was associated three times with staphylococcus alb., once with pneumococcus, and it appears comparatively late in the aural discharge. Simmonds and Fraenkel found in the suppuration of persons who had died with otitis media, as the only kind the staphylococcus flavus, and finally Rohrer proved the existence of a staphylococcus albus, but it cannot be ascertained whether the latter caused specific clinical symptoms.

How do the microörganisms enter the middle ear ? Several paths serve this purpose. The frequency of bilateral inflammations of the middle ear in conjunction with the inflammations of the adjoining cavities of the nose and throat point to the fact that the source of the microbes should be looked for in the oral cavity, whence they pass through the tubes.

This kind of the infection explains the occurrence of otitis media in typhoid fever, rubeola, diphtheria, recurrens, and others, these diseases being almost invariably associated with affections of the pharynx. Dryness of the oral cavity, together with difficulty in swallowing, furthers the enormous propagation of the microbes in this locality, and at a time when the energy of the entire constitution is lowered to such an extent as to offer no resistance to the transference of these microbes. Besides, the microbes may migrate through the lymph- and blood-vessels into the middle ear, which is rarely the case.

The frequency with which the infection starts from the pharynx necessitates, at any rate, the importance of the strictest possible asepsis in fevers. The illustrations appeared in the following number of the *Annales.* GEORGES GELLÉ.

4 and 5. The first paper is a brief review of the lecture delivered at the last meeting of naturalists ; the second is an extensive

monograph describing and illustrating the different forms of bacteria which the author has found in the secretions of numerous cases of otitis. The work is thorough, and can be recommended for study as well as for reference.

b.—NASO-PHARYNGEAL CAVITY.

1. SCHWABACH, Berlin. Contribution to the development of the pharyngeal tonsil. (From the Anatomical Institute of Berlin.) With one plate. *Arch. of Microscop. Anat.*, vol. xxxii., p. 187.

2. KILLIAN, G., Freiburg i. Br. On the bursa and tonsilla pharyngea. "Habilitation paper" (qualifying for lectureship).

3. KIESSELBACH. On the amount of mucus in the nasal polypi. *Monatsschr. f. Ohrenheilk.*, etc., 1888, No. 12.

4. GRUBER, WENZEL. Anatomical notes. On cases of partition of the maxillary sinus by a septum osseum perfectum into two entirely separate sinus maxillares secundarii, with separate openings leading into the meatus narium medius. *Virchow's Archiv*, vol. cxiii., p. 530.

1. Forty-five human embryos were examined; of 22 of these were made series of sagittal sections, and of 4 series of frontal sections. Almost all specimens were macroscopically examined.

2. The careful and exhaustive paper is illustrated with a great number of drawings. Sixty-five human embryos, 3 new-born, 2 children from the first year of age, and a great many animals were examined. In 28 among the 70 human subjects the bursa was entirely absent. Eight of these from the sixth and eighth month presented at the roof of the pharynx numerous folds of the mucous membrane, which represent the rudiment of the pharyngeal tonsil. Forty-two showed a more or less deep small pit; 14 cases, however, presented classical examples of a real bursa pharyngea in the human embryo (4 of these with pharyngeal tonsil).

3. The author attributes the difference of opinion between himself and Hopmann with regard to his claims to the presence of mucus in the nasal polypi, to the different procedure of procuring the material for examination. He also believes that the peculiar character of the nasal polypi is essentially dependent upon œdemata from congestion, but he has of late found mucus in all specimens examined.

4. The author observed the abnormality of the maxillary cavity mentioned in the heading, three times on one side, twice bilater-

ally; in one case the antrum was on one side divided by septa into three cavities, the two smaller of which communicated with each other in such a manner as to present two openings leading into the middle nasal meatus.

B.—PHYSIOLOGY AND PHYSICS.

a.—HEARING ORGAN.

1. BREUER, I., Vienna. New experiments made on the semicircular canals. *Pflüger's Arch. f. Physiol.*, vol. xliv., p. 135.

2. GRADENIGO, GIUSEPPE (Lecturer on otology at the Royal University of Padua). The electrical reaction of the acoustic nerve. Preliminary communication. *Centralbl. f. d. med. Wissensch.*, 1888, No. 39, 40, and 41.

3. LOEWENBERG, B. Physiological researches on nasal sounds. *Trans. 9th Intern. Med. Cong.*, 1887.

4. MALONEY, J. A. The sphenoid bone: some of its probable functions. *N. Y. Med. Jour.*, Aug. 11, 1888.

5. RICHEY, S. O. The primary physiological purpose of the membrana tympani. *Trans. Amer. Otol. Soc.*, 1888.

1. Baginski has, from his experiments, arrived at the conclusion that an irritation of the semicircular canals without simultaneous irritation of the brain is impossible, and that, therefore, one is not justified in drawing inferences from symptoms occurring after irritation of one semicircular canal as to the function of the semicircular canals. The author dissected the semicircular canals and applied the irritation to the entirely intact osseous ampullæ in slight ether narcosis. He made experiments with thermal, electrical, and mechanical irritation. BREUER arrives, from his experiments, which are entirely unobjectionable, at the following conclusions: From each ampulla, resp. each semicircular canal, movements of the head in the plane of the corresponding canal may be produced by mechanical, thermal, and electrical irritation. A direct irritation of the cerebellum thereby does not take place. The latter takes part in the phenomena probably as a reflex centre, one peripheral sensory organ of which is the vestibule. The movements are, in some of the experiments, produced by endolymphatic currents, the direction of which determines the direction of the movements of the head in the manner theoretically demanded. The phenomena of the galvanic vertigo appear under

conditions which exclude the supposition of an association with secondary currents in the brain. The galvanic vertigo is chiefly produced by irritation of the vestibular apparatus, like the galvanic phosphene by irritation of the retina.

2. GRADENIGO placed in his experiments the positive electrode either in front of the tragus or upon the external meatus filled with water, the negative upon the nape of the neck. He arrives at the following results: (1) Under entirely normal conditions one can but exceptionally produce a reaction of the acoustic nerve, even with the greatest intensity of current, which can still be borne on the head. *One ought therefore not to speak of a normal reaction of the acoustic.* (2) The diseases with regard to the electrical action are divided into two classes: into those with, and into those without, increased irritability of the acoustic. The author describes the electrical reactions in the various forms of ear disease, and attributes great importance to them.

3. LOEWENBERG has found the musical notes for each nasal vowel as determined by a corresponding vibration of the tuning-forks of Koenig and as compared with the known vowel sounds. He first took the French nasal vowels on, an, en, un, and then the non-French nasal vowels ong, ang, eng, ung, and found that the proper sound of the French nasal sounds of the first three series are very nearly the minor thirds inferior to the notes for the corresponding simple vowels, while those of the non-French ones approach by about half a tone the lower octave of these.

SWAN M. BURNETT.

4. MALONEY has found by experiment that the sphenoid transmits vibrations much more readily than any of the other cranial bones. These experiments were made both with gross vibrations and with the more delicate ones, using in the latter case the telephone as the receptive instrument. By this high conductibility on the part of the sphenoid he accounts (1) for the localization of sounds, "the indirect or bone-conduction being through the sphenoid (from one wing to the other, and thence to the internal ear on the opposite side), thus probably gives a maximum and minimum sensation by which the mental act of localization of sound is accomplished." (2) *Tinnitus aurium*, he thinks, may come often from transmission of the vibrations of the sphenoid derived from the blood currents passing through it. (3) *Autophonia* may in some instances be accounted for by the transmission of vibrations from the resonant cavity of the pharynx directly through the sphenoid

to the auditory nerves. (4) *Colored audition*, he thinks, might be accounted for by the transmission of the vibrations of sound through the sphenoid to the optic nerve as it passes through the optic foramen and thence to the visual centre.

SWAN M. BURNETT.

5. RICHEY'S conclusions are as follows: (1) The primary function of the membrane of the tympanum is one of protection: to prevent drying and stiffening of the membrana secundaria and the joints of the ossicles, etc. (2) The function of the *Mt* as a transmitting mechanism is secondary. (3) A permanent opening of the *Mt* may temporarily improve hearing, but not permanently; and (4) the effect of nature to heal perforations should be encouraged.

SWAN M. BURNETT.

b.—NASO-PHARYNGEAL CAVITY.

1. ZWAARDEMAKER, H. On the determination of the intensity of smell. *Berliner klin. Wochenschr.*, 1888, p. 950.

1. The author determines the intensity of smell by the following simple instrument: Of two tubes sliding into each other the inner surface of the outer tube is painted with a smelling material. According as one pushes the inner tube more or less deeply into the other a smaller or larger surface of the smelling substance will be exposed to the air striking it, and will give off a corresponding amount of odorous substances. If one breathes through the prolonged end of the inner tube one can readily compare at a scale attached to the outer tube the different intensity of smell, and determine this in each case as fraction formed by the decreased and the normal sensation.

II.—PATHOLOGY AND THERAPEUTICS.

BY A. HARTMANN, BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

GENERAL LITERATURE.

1. WAGENHÄUSER. Report on the work done at the university policlinic for ear patients at Tübingen from April 1, 1884, to April 1, 1888. *Arch. f. Ohrenheilk.*, vol. xxvii., p. 156.

2. BISHOP, S. S. Statistical report of 5,700 cases of ear disease, classified by age, sex, occupation, and disease. *Trans. 9th Intern. Med. Cong.*, 1887.

3. BLAU, L., Berlin. The affections of the hearing organ in measles. *Arch. f. Ohrenheilk.*, vol., xxvii., p. 139.

4. GELLÉ. On deafness in albuminuria. *Soc. Biol.*, March, 2, 1888.

5. WAGNIER. Otite moyenne aiguë observée sur un lépreux; examen des cavités du nez, du pharynx, et du larynx. *Annales de dermatologie*, etc., Série ii.

6. LICHTWITZ, L. On creoline, and its application to diseases of the nose, ears, and pharynx. *Bull. med.*, 1888, No. 78.

7. RICHEY, S. O. Is general atrophy of the conducting apparatus of the ear identical with progressive arthritis deformans? *Trans. 9th Intern. Med. Cong.*, 1887.

8. HOBBY, C. M. Cerebro-spinal fever as a cause of deafness. *Trans. 9th Intern. Med. Cong.*, 1887.

9. MURRELL, T. E. Peculiarities in the structure and diseases of the ear in the negro. *Trans. 9th Intern. Med. Cong.*, 1887.

1. At the university policlinic of Tübingen, 1,851 patients were treated during four years, 115 of which were operated on. The auricle was detached in one case for removal of a foreign body. Exostosis in the auditory meatus was observed in a patient, seventeen years of age. In one case acute otitis media, together with the severest cerebral symptoms (opisthotonus, rigidity of the neck, spasms of the extensor muscles, Cheyne-Stokes respiratory phenomenon), was observed, caused by the entrance into the ear of an ascaris lumbricoides, 10 *cm* long and 2 *mm* thick. After its removal from the meatus, in cleansing the ear, all symptoms disappeared. With regard to ear diseases following measles, WAGENHÄUSER found in almost all cases considerable secretion in the nose and naso-pharynx, and therefore believes that we have mostly to deal with processes propagated from the naso-pharynx.

2. Only the salient points of BISHOP'S paper can be given. Of the whole number 5.1 % were affected with acute catarrhal inflammation; 5.3 % with acute suppurative inflammation; 53 % with chronic non-suppurative disease. The external ear was affected in 8 %, the internal ear in 2 %, and 6 % were deaf-mutes. More than half of these had in-door occupations. The sexes were affected in equal proportion. Children under fifteen years constituted about 28 % of the whole number of cases.

SWAN M. BURNETT.

3. BLAU reports his observations on diseases of the hearing organ in measles. They comprise 65 cases among 2,560 ear patients.

According to the statistical reports, there are 3.1 % of the affections of the hearing organ in measles, and 5.2 % in scarlatina. Blau thinks, like Tobeitz, that in aural complications in morbilli, we have to deal with a primary exanthematous disease of the hearing organ. The cases observed by him belong to the following ear diseases: Otitis media catarrhalis acuta, 12 cases; otitis media suppurativa acuta, 16; otitis media suppurativa chronica, 31; remnants of chronic inflammatory processes in the middle ear, 12; otitis externa diphtheritica, 1; nervous deafness, 3. All acute cases were cured, with recovery of normal hearing power. In the chronic cases, extreme deafness frequently remains.

4. GELLÉ reports an observation of sudden deafness during albuminuria, which was associated with pneumogastric affections.

5. WAGNIER found one external meatus of a leper filled with fairly hard yellowish and firmly adherent crusts. After their removal the walls appeared lined with white lamellæ, upon an uneven surface. The drum-membrane had the same appearance, visibly reddened at one spot. Considerable deafness. On the other side the same condition, besides perforation of the memb. tymp. and purulent discharge. The crusts overlying both meatuses formed anew after their removal. Wagnier believes that there were leprous nodules in this ear. Besides, they were found upon the soft palate and in the larynx.

6. LICHTWITZ recommends creoline as the strongest disinfectant and deodorizing remedy for all diseases in which offensive smells originating in the cavities of the nose, mouth, or ear have to be removed. It diminishes the pathological secretions in cases of rhinitis atrophicans, fibrosa, and in otorrhœa. It is a powerful antiseptic and is easily applied, besides being hardly poisonous when compared with other drugs. Lichtwitz uses in the nose a diluted emulsion 1 : 5,000 to 1 : 2,000, whilst in pharyngitides and oral affections stronger solutions of $\frac{1}{2}$ to 1:100 are necessary. In the ears, 1:1,000 are used for injections, and more concentrated for instillations. GELLÉ.

7. RICHEY traces out in his paper the similarity between progressive arthritis deformans and general atrophy of the conducting apparatus of the ear point by point, and is thoroughly convinced that many cases of "dry catarrh" of the middle ear are due to this authentic affection of the joints of the ossicula and their other bony connections. SWAN M. BURNETT.

8. HOBBY gives statistics from the State Board of Health of Iowa and from the Iowa Institution for the Deaf and Dumb. His conclusions are : That cerebro-spinal fever is equal in importance in the production of deafness with scarlet-fever, and that those cases which are often reported as due to "fever," "congenital," unknown," etc., are really due to this. SWAN M. BURNETT.

9. MURRELL has found that the auditory canal in the negro is very large and straight, enabling the memb. tymp. to be examined without a speculum. The memb. tymp. itself offers nothing peculiar. The mastoid process is smaller than in the white race: The pharyngeal openings of the Eustachian tubes are very broad, and the inferior meatus of the nose are larger. The auricle is less liable to cutaneous affections than in the white man. He has never seen any parasitic disease of the external auditory canal in that race, nor a furuncle. He finds otitis med-supp. acuta not infrequent an affection, but it is usually mild in its course, as is the chronic form, which is rare even in children of the pure type. In mulattoes it is more common. He has never seen a case of mastoiditis in the race. In 421 aural cases amongst this race there was not one of chronic aural catarrh. Their exemption from these troubles the author thinks largely due to the formation of the naso-pharynx. In fact ear diseases are very infrequent in this race as compared with the white race, and excludiag deaf-mutes, there are very few negroes who have not sufficient hearing power to understand ordinary conversation. All of this the reviewer can corroborate. See his paper in these ARCHIVES, vol. xvi., No. 4.

SWAN M. BURNETT.

INSTRUMENTS AND METHODS OF EXAMINATION.

10. SEXTON, S. A new head lantern for the employment of electric light in aural surgery. *Trans. Amer. Otol. Soc.*, 1888.

11. BISHOP, S. S. A new otoscope (pneumatic) for the diagnosis of middle-ear affections under passive motion. *Jour. Amer. Med. Ass'n*, Sept. 22, 1888.

12. YOUNG, H. B. The techniphone snap a substitute for the watch as a test for hearing. *Trans. 9th Intern. Med. Cong.*, 1887.

13. TANSLEY, J. O. An improved aural snare. *Trans. Amer. Otol. Soc.*, 1888.

10. SEXTON exhibited a modification of the Trouvé lantern for use in aural surgery. It is figured, as is also the portable storage battery for running it. SWAN M. BURNETT.

11. BISHOP'S new otoscope is a milled cylinder, with an ear funnel at one end, and an eye-piece containing a lens around which revolves an adjustable mirror at the other. In the funnel end is a pneumatic chamber with a flexible tube ending in a rubber bulb or lip-piece. The tip of the funnel is covered with a thin rubber tubing to cause it to fit more closely in the meatus. The manner of working it is similar of course to Sigle's well-known apparatus. He has found it of benefit in those cases where there were adhesions in the drum cavity, and has never seen any ill results follow its use. SWAN M. BURNETT.

12. The techniphone of YOUNG consists of a steel strip 3 *cm* long, 1 *cm* wide, and $\frac{1}{4}$ *mm* in thickness, slightly dished (dented) at its centre. This is taken between the thumb and forefinger, and pressure on its edges makes a snapping sound after the manner of a well-known toy. SWAN M. BURNETT.

13. In TANSLEY'S snare the wire is fixed to the axle of a bobbin which is turned by the milled heads at each end. Either one or both ends of the wire may be fastened by the bobbin. The advantage claimed is that there is no sudden jump or jerk of the instrument when the polypus is cut through.

SWAN M. BURNETT.

EXTERNAL EAR.

14. SOUTHAM, T. A. On the occurrence of hæmatoma of the ear in football players. *Brit. Med. Jour.*, p. 1277, 1888.

15. LOEWENBERG, Paris. On the nature and the treatment of the furuncle, especially in the external ear. *Deutsch. med. Wochenschr.*, No. 28, 1888.

16. LOEWENBERG, B. On the treatment and bacteriology of aural furuncles. *Trans. 9th Internat. Med. Congr.*, 1887.

17. FELICI FRANC. Sifilide dell' orecchio. *Boll. delle mal. dell' orecchio*, etc. No. 3, 1887.

18. KOLLOCK, C. W. Foreign bodies in the external auditory canal. *N. Y. Med. Jour.*, August 18, 1888.

19. SEXTON, SAMUEL. Foreign bodies in the external auditory canal. *Tran. Amer. Otol. Soc.*, 1888.

20. BEZOLD, Munich. Foreign bodies in the ear. *Berliner klin. Wochensch.*, No. 26, 1888.

21. MARIAN, Aussig. On foreign bodies in the ear and in the nose. *Prager med. Wochenschr.*, No. 42, 1888.

22. RICHARDS, HUNTINGTON. A case of "false drum." *Trans. Amer. Otol. Soc.*, 1888.

14. SOUTHAM discusses the frequency of othæmatoma in foot-ball players. Its occurrence is facilitated by the fact, that the trauma acts on the ear in a state of congestion. The blood effusion is, as a rule, absorbed. In the reported case, a new swelling appeared at each new game; recovery took place with considerable deformity.

15. LOEWENBERG refers in the latest communication to his former well-known articles on the occurrence of micrococci in aural furuncles and on the infectiousness of furuncles. From the latter the transmission to other persons and to other regions of the body, and the tendency to relapses are explained. Loewenberg found to be most frequent, in the cultures made from the contents of the furuncle, the staphylococcus albus,—which was missing in one case only, and of the same frequency the staphylococcus aureus and citreus. In a single case all three forms of staphylococci were present. Loewenberg's treatment consists in aural baths with saturated solutions of boric acid in absolute alcohol. He succeeds in great many cases in cutting short the duration of the affection, whilst he is not so successful in others. Relapses are prevented by this treatment. The remedy may be used as a prophylactic.

16. This article does not contain any thing differing from the preceding one.

17. FELICI describes a syphilitic primary affection of the external meatus and the secondary and tertiary forms of syphilis of the ear. He points out that one has to think of a syphilitic affection of the inner ear in Ménière's vertigo with rapid decrease of bone-conduction for the tuning-fork.

18. KOLLOCK relates a case where two apple seeds had remained in the ear for forty years. Though that ear was very deaf the hardness of hearing seemed to be quite independent of the foreign bodies. SWAN M. BURNETT.

19. SEXTON gives statistics of 101 foreign bodies in the external meatus which he has recorded in his practice. Of these, a more or less detailed account is given of 39, which seemed to the author as having some special interest. Almost every department of animate and inanimate nature was represented. Cockroaches

were largest in number (13), cherry-stones 8 ; cotton-wool pellets 10, small stones 8, beans 6, bed-bugs 5, flies 5, maggots and peas 4 each. In their removal he used his own glass syringe which has already been described, his foreign-body forceps, and foreign-body curette, all of which are figured.

SWAN M. BURNETT.

20. BEZOLD is right to inveigh against the attempts at extracting foreign bodies in the ear without illumination with the forehead mirror and the necessary practice in handling the instruments used for this purpose. Crude attempts, though made by surgeons, frequently resulted in leptomeningitis, brain abscess, and death within one to four weeks, whilst the foreign body itself never or rarely presents such disastrous results. He adds to six such cases already published, a contribution on the difficult abstraction of carob seeds, which, conforming to the shape of the cavity of the recess in children, entirely fill this cavity, and thus offer to all manipulations acting a tergo insuperable obstacles.[1] Bezold's patient, a girl of six years of age, died also in the third week from a leptomeningitis and thrombosis of the transverse sinus, purulent disintegration. The author is inclined to believe that at least a part of the cases of reflex neuroses which have been described in literature as due to foreign bodies, should be attributed to beginning meningitis. If deafness arises, the indicatio vitalis requires chiselling of the mastoid process, with removal of the posterior wall of the external auditory meatus for the immediate extraction of the foreign body ; in inflammatory processes of mastoid, chiselling would also be indicated.

21. MARIAN found, among 2,626 ear patients, 37 cases of foreign bodies, which percentage, 1.4 per cent., is in accordance with the publication of other authors. The longest period during which a foreign body remained in the ear was thirty years. The author, like every writer on the subject, warns against the forcible removal of such bodies by instruments whilst they can remain in the ear harmlessly for a long time.

22. In RICHARDS' case the hearing in the affected ear was totally lost, and there was a vague recollection of an otitis media in childhood. At some distance in front of the normal position of the drum-head a membrane was stretched across the lumen of the auditory canal. It merged into the skin at the periphery and resembled the same in color and touch. It was smooth, with

[1] Compare Dr. Sargent's case in vol. xvii., p. 102, of these ARCHIVES.—K.

no suggestion of malleus handle or light spot. It was incised, causing no pain, though the edges of the incision were bloody. Beyond it was found the deep cavity, reaching to the promontory, the real membrana tympani being absent. The hearing power was not improved by the operation. SWAN M. BURNETT.

MIDDLE EAR.

23. Moos, Heidelberg. Contribution to the bacteriological diagnosis and prognosis of suppurations of the middle ear. *Deutsche med. Wochenschrift*, 1888, No. 44.

24. ROHRER, Zurich. On the pathogeny of bacteria and purulent processes of the ear. *Ibid.*

25. CHATELLIER. Acute otitis media with exudation. Bacteriological examination. Soc. Anatomique, Nov. 23, 1888.

26. RING, FRANK W. Four cases of acute inflammation of the middle ear from the use of Roosa's nasal inhaler. *Medical Record*, Aug. 11, 1888.

27. KIPP, C. J. Three cases of transient bilateral horizontal nystagmus occurring in connection with purulent inflammation of the middle ear. *Trans. Amer. Otol. Soc.*, 1888.

28. POMEROY, O. D. A case of chronic suppurative otitis media with abscess in the neck and destructive purulent iridochoroiditis, probably metastatic. *Trans. Amer. Otol. Soc.*, 1888.

29. STONE, GEORGE, Liverpool. Aural polypus. *Medico-Chirurgical Journal*, July, 1888.

30. RICHARDS, HUNTINGTON. A case of polypoid angioma of the ear, with three micro-photographs. *Trans. Amer. Otol. Soc.*, 1888.

31. SUAREZ DE MENDOZA. Sur un cas d'épilepsie guéri par l'ablation d'un polype de la caisse qui occupait tout le conduit auditif. *Revue mens. de laryngologie*, etc., 1888, No. 8.

32. THEOBALD, SAMUEL. The employment of boracic acid in solution in the treatment of otitis media suppurativa. *Trans. Amer. Otol. Soc.*, 1888.

33. BERMANN, ISIDOR. The uses of lactic acid in chronic suppurative otitis. *Jour. Amer. Med. Ass'n*, Aug. 11, 1888.

34. EMERSON, J. B. The flexible catheter as a drainage-tube *Trans. Amer. Otol. Soc.*, 1888.

35. TILLEY, ROBERT. Inherited syphilis as a factor in suppurative inflammation of the middle ear. *Trans. 9th Intern. Med. Cong.*, 1887.

36. BURNETT, C. H. Chronic purulent inflammation of the tympanic attic (recessus epitympanicus). Based on the observation of 10 cases additional to 10 cases already reported elsewhere. *Trans. Amer. Otol. Soc.*, 1888.

37. SEXTON, SAMUEL. Excision of the drum-head and ossicles for the cure of chronic purulent inflammation of the attic of the tympanum. *Trans. Amer. Otol. Soc.*, 1888.

38. HOFFMANN, E. Contribution to the pathology and therapeutics of pachymeningitis externa purulenta following inflammation of the middle ear. *Deutsche Zeitschr. f. Chirurgie*, vol xxviii.

39. ROSSI, EMILIO DE. Passaggio intracranico della marcia nella carie del temporale con ascessi per congestione al colle. *Atti della R. academia medica di Roma*, anno v., vol. iv., series 2.

40. BACON, GORHAM. A case of cerebral abscess following extensive necrosis of the temporal bone in which the skull was trephined by Dr. Robert F. Weir. Death from secondary hemorrhage. Autopsy. *Trans. Amer. Otol. Soc.*, 1888.

41. FULTON, JOHN F. Acute primary inflammation of the mastoid cells. *Trans. 9th Intern. Med. Cong.*, 1887.

42. FROTHINGHAM, G. E. The indications for the artificial perforation of the mastoid process and the best method of performing the operation. *Trans. 9th Intern. Med. Cong.*, 1887.

43. SCHMIEGELOW, E., Copenhagen. Resectio processus mastoidei. 30 operations. *Nord. med. Arch.*, 1888, vol. xx., No. 9.

44. The chisel as a bone-cutting instrument in opening the mastoid. The late Senator Conkling's case. *Internat. Jour. Surg. and Antiseptics*, April, 1888.

45. BERGER. On the procedure for the removal of projectiles of small calibre which have entered the tympanic cavity. *Soc. de Chirurgie*, Oct. 10, 1888.

46. LAUTERBACH, L. J. The value of nitro-glycerine in tinnitus aurium. *Trans. 9th Intern. Med. Cong.*, 1887.

47. TANSLEY, J. O. Nasal difficulties in ear diseases. *Trans. Amer. Otol. Soc.*, 1888.

48. The importance of the chain of ossicles for the transmission of sound. *Soc. de Biologie*, Oct. 13, 1888.

23. Moos confirms by three communications Zaufal's statements on the importance of bacteria in suppurative otitis media. In the first case of chronic suppuration of the middle ear in a diabetic with inflammation of the mastoid process and abscess formation, there were found in the discharged pus numerous streptococci and the diplococcus of Fraenkel-Weichselbaum. The same condition was found in a second analogous case. In a third case of polypi and cholesteteatoma with caries, phlebitis, and thrombosis of the lateral sinus, septic thrombosis in the bulbus venæ jugularis, meningitis purulenta of the base, and cerebellar abscess—large masses of streptococci were present in the cholesteatomatous masses. Moos believes that we have advanced considerably by Zaufal's examinations, both in the diagnosis and prognosis of the suppuration of the middle ear.

24. According to ROHRER'S examinations, made on a hundred patients with otorrhœa and ten with dermal affection of the external ear, there were found in the non-fetid otorrhœa only cocci, in the fetid discharge cocci and bacilli. The secretions of the acute cases contain only bacilli (72 per cent.), and after they had become fetid, cocci (28 per cent.). In the chronic forms 49 per cent. had cocci and 51 per cent. bacilli, etc. The dermal affections of external meatus and the auricle presented 82 per cent. cocci and 18 per cent. bacilli. Injections into the abdominal cavity of guinea-pigs with the cultures of pathogenic microbes gave negative results. The diplococci found in the dermal affections when rubbed into the epidermis produced an eczema.

25. In CHATELLIER'S case only staphylococcus pyogenes albus and aureus were found in the discharge of the tympanum ; it is important to note that no air had access. Hence we may conclude that the discharge had contained the staphylococci from the beginning.

26. RING relates briefly the histories of four cases in which he attributes an acute attack of otitis media to the use of Roosa's pyriform bulb or Politzer's inflator. He is inclined to think that the trouble was brought about by the injection of germs contained in the sponge of the pyriform bulb into the middle ear by the force of the air current from the bag. Whether these germs were contained in the Croton water with which the sponge was moistened, or in mucus which may have been sucked into the bulb, he is undecided.

SWAN M. BURNETT.

27. A résumé of KIPP's three cases is as follows :

CASE I.—Chronic purulent inflammation of the middle ear, both sides, acute exacerbation in left ear. Severe pain in mastoid process and head. Intense vertigo, bilateral horizontal nystagmus lasting four days. Loss of sense of smell. Recovery.

CASE II.—Acute purulent inflammation of the middle ear. Large, deep-seated abscess below apex of mastoid. Intense vertigo. Transient bilateral horizontal nystagmus caused by injection into abscess. Recovery.

CASE III.—Acute purulent inflammation of middle ear. Abscess of mastoid cells. Nystagmus caused by pressure on mastoid process. Recovery.

The author has no other explanation of these cases to offer than that it is probable that pressure was communicated by the chain of bones in the usual way to the semicircular canals (which were also probably not in a normal condition), and the irritation was reflected in some as yet unknown way to the centre controlling the movements of the eye muscles.

SWAN M. BURNETT.

28. POMEROY'S patient was a man of fifty-six, who had had otitis media suppurativa acuta, but had become convalescent. Some months later there was pain and swelling on the right side of the neck, extending to the shoulder, and elevation of the temperature. In a few days the eye on that side became affected and a pronounced suppurative irido-choroiditis set in, which finally led to the enucleation of the eye. The neck trouble became worse and finally an abscess was found beneath the trapezii muscles and opened. The ear trouble progressed well. There was no connection found between the tympanum and the abscess in the neck. The author is inclined to think that in his case the inflammation extended to the meninges and thence along the optic-nerve sheath to the eye.

SWAN M. BURNETT.

29. STONE reports a case of an aural polypus which presented special difficulties to its removal owing to its adhesion to the walls of the external meatus. The removal of the polypus was unsuccessful with the snare, but succeeded after the adhesions were severed, during narcosis, with the hollow chisel.

30. RICHARD'S patient was a girl of six years who presented the usual picture of polypus associated with chronic purulent otitis media. The polypus, which was red in color, like a blood

cyst, was removed with a snare, and found on examination to be a true angioma. The drum-head was depressed, but probably not perforated, and the hearing was restored.

SWAN M. BURNETT.

31. SUAREZ DE MENDOZA'S patient had otorrhea eleven years, epilepsy nine years, and formation of aural polypi six years. The epileptic attacks occurred three to four times a week, namely, in cleansing the ear, while washing, and when the patient changed his position during sleep. The author could even on slight pressure upon the polypus produce an attack. After removal of the polypi no new attack occurred.

32. THEOBALD thinks that the best method of using boracic acid in acute cases of otitis media, particularly where there is but a small perforation of the drum-head, is in the form of a saturated solution. The histories of five cases are given in illustration of the method of treatment. SWAN M. BURNETT.

33. BERMANN reports that he has been very successful in treating chronic suppurative otitis by means of the topical application of lactic acid. As the acid has great tendency to macerate the epidermis, he first coats the walls of the external meatus with a thin layer of paraffine. He then fills up the ear with a 30 or 40 per cent. solution of the lactic acid, and allows it to remain twenty minutes. It has a most marked effect upon the offensive odor even after the first three or four applications. When the discharge has stopped he uses insufflations of powdered boric acid.

SWAN M. BURNETT.

34. In certain cases of deep-seated inflammation of the auditory canal and mastoid cells, where it is necessary to establish drainage through a fistula, EMERSON has found the flexible catheter to fulfil all requirements. It secures free drainage, is sufficiently firm to be easily inserted, and yet flexible enough to adapt itself to the parts. Four cases are reported in which it was used with success. SWAN M. BURNETT.

35. TILLEY is of the opinion that inherited syphilis may be the cause of suppurative inflammation of the middle ear, and in cases of this kind always looks for the signs of inherited disease. If found, anti-syphilitic remedies are used in addition to the usual local applications. SWAN M. BURNETT.

36. After a brief allusion to the literature on the subject of chronic purulent inflammation of the attic, which is confined exclusively to America and Germany, BURNETT gives the histories,

in more or less detail, of ten cases, additional to ten reported elsewhere, principally in his "Treatise on the Ear." It is not a disease of childhood (one case in twenty), the hearing is greatly impaired in the chronic form, the discharge is thick, scanty, and very offensive. The "perforation whistle" is usually absent. The disease is difficult to cure, and the best form of treatment is cleansing and antiseptic, preferably peroxide of hydrogen and carbolic acid. The only way of washing out the attic and medicating it is by the tympanic syringe of C. J. Blake. Applications in powder do no good, but rather harm. SWAN M. BURNETT.

37. SEXTON advocates excision of the ossicles and membrana tympani in the manner already described by him for cases of chronic purulent inflammation of the attic. No cases are given, but the author states that his experience of three years with this operation leads him to hope much for it in this class of cases.

SWAN M. BURNETT.

38. HOFFMANN reports in the present paper his experience on pachymeningitis externa purulenta with reference to the opinion of other authors on this disease. It deserves, he thinks, more attention than was paid to it heretofore. Hoffmann collates 101 cases of ear diseases with fatal issue, with which inflammation of the dura mater was associated. In the living, four cases were observed by other authors, four by himself, whose histories are communicated. Among them is a case of cured sinus thrombosis. Hoffmann concludes his paper as follows: "The purulent pachymeningitis externa occurs most frequently among the intracranial affections, but on account of its indefinite symptoms it has not been recognized in the living except in a few cases. It forms most frequently the connecting link with the intracranial diseases, which almost invariably end fatally, viz.: with meningitis, sinus phlebitis, and brain abscess. These secondary diseases are favored by the long duration of the pachymeningitis and the retention of pus produced by it. When in otitis media the bone is affected one should think of the complication with pachymeningitis, if after opening of the mastoid process the dangerous symptoms continue or the symptoms of beginning meningitis or sinus phlebitis appear. The treatment should be operative, should mostly follow the opening of the mastoid, and consist in denuding the inflamed dura mater."

39. ROSSI discusses the different paths which the pus may take in caries of the temporal bone toward the interior of the skull,

and reports an interesting case. It was an acute otitis media without perforation of the drum-membrane leading to abscess upon the mastoid process and the entire side of the neck. On chiselling of the mastoid, caries of the sinus sigmoideus, and a subdural abscess were found, which were connected with the abscess of the neck. Rossi concludes from his observations that, when symptoms of intra- or extra-cranial abscess arise, the mastoid process should be chiselled and the pus be looked for also in the sulcus sigmoideus.

40. BACON'S case presented the usual history of purulent otitis media with formation of polypi and granulations associated with bone disease in a man aged thirty. Finally left fascial paralysis developed, and in the soft parts above the pinna an abscess was formed, which was opened. A probe introduced into this opening entered a cavity leading downwards towards the articulation of the jaw. Temporary relief followed, but a more extensive operation was decided upon and performed. Extensive necrosis of the anterior bony wall of the auditory canal and middle ear was found. The mastoid was opened with chisels, but found healthy. The cavity was drained and cleansed with bichloride. Patient improved for some days, then pains through forehead and side of the neck set in. He had aphasic symptoms. No chill, but increase of temperature. No optic papillitis. Dr. Weir called in consultation and thought there was probably an abscess in frontal lobe, but advised first a free opening in the mastoid. No trouble was found in the mastoid, but a large opening in the squamous portion of the temporal bone was found. An incision in the brain brought out half an ounce of pus. Later, Dr. Weir in attempting to make counter-drainage, as he thinks, wounded the middle cerebral artery, and the patient died probably from secondary hemorrhage. At the autopsy the entire bony auditory canal was found to have been destroyed.

SWAN M. BURNETT.

41. FULTON relates a case of primary acute inflammation of the mastoid in which there had been no preëxisting trouble of the middle ear. The bone was trephined, but no pus was found. The cells, however, were exceedingly vascular and seemed to be undergoing a sclerosing process. The patient was completely relieved. SWAN M. BURNETT.

42. FROTHINGHAM in his paper reviews the whole ground of mastoid disease and the indication for operation. He expresses

the views held by the majority of aurists in regard to an early operation, and prefers the chisel and mallet as the means of opening the bone. SWAN M. BURNETT.

43. SCHMIEGELOW reports the histories of thirty chisellings of the mastoid process. Twelve cases were acute processes and eighteen chronic inflammations. In six cases the dura mater during the operation was more or less visible at the bottom of the wound. In two cases an abundant bleeding occurred by injury to the lateral sinus. One of these patients died suddenly on the seventh day after the operation, probably in consequence of embolism of the pulmonal artery. In seven cases (23 %) only Schmiegelow succeeded in syringing to prove the existence of a communication with the middle ear. Three of these cases were cured, one died, in three the suppuration of the middle ear persisted. In about one half of the others the otorrhœa was cured, but not in the other half.

44. This editorial is a protest against the employment of the chisel for piercing the bone in diseases of the mastoid process. Saws or drills, worked by electricity, are recommended for this purpose. SWAN M. BURNETT.

45. BERGER, omitting all the cases with a superficial wound, or with injury to the brain produced by the ball piercing the ear, directs his attention to those cases in which a ball, closely following the course of the external auditory meatus, and destroying the drum membrane and the chain of ossicles, was arrested at the inner wall of the tympanic cavity, and had lodged there. The author believes that it is indicated under such circumstances to localize the foreign body and extract it. The procedure, when carried out with antisepsis, is harmless and cannot essentially interfere with the condition of the injured person. In order to procure direct and convenient access, it is commendable to detach the upper half of the auricle in such a manner as to turn it afterwards aside, as has first been done by Verneuile. The section runs almost through the attachment of the cartilaginous part of the auricle to the osseous auditory meatus; the length of the auditory meatus is diminished in this way about one half. If the path is not as yet sufficiently wide, the auditory meatus should be incised from the rear and the anterior limit of the apophysis of the mastoid process chiselled off. It then remains to chisel off with the instrument devised by Trouvé the ball, which should be done with the utmost precaution and the least possible force. In two

such cases with complete deafness the hearing power was not only completely restored, but suppuration, inflammation, and paralytic symptoms disappeared. Terillon has in one case in which the ball was lodged at considerable depth, employed the following expedient. He applied the trephine in a line closely corresponding to that of the auditory meatus, and removed the cells of the mastoid process, thereby tilting the ball over in such a way as to make it fall out. Recovery was extremely smooth. Desprès points out, that the extraction ought not to be attempted at the expense of extensive destructions, and he refuted all such procedures, as the ball is from the nature of the tissues in itself harmless. Berger advocates the immediate removal of the projectile, which improves considerably the chances for a favorable result. G. GELLÉ, Paris.

46. LAUTENBACH has found the internal administration of nitro-glycerine of value in cases of tinnitus, especially where there was a cardiac lesion, functional or organic, and where there was little or no loss of hearing. He gives it in doses of $\frac{1}{100}$ of a grain, increasing from one pill a day to six, if necessary.

SWAN M. BURNETT.

47. TANSLEY'S paper is quite lengthy, and a mere abstract would not do it justice, since he goes over the whole ground of nasal and post-nasal difficulties, all of which are liable to form a complication in ear diseases and generally as causes. He treats the subject under the following headings: 1. Any thing which wholly or partially occludes one or both nostrils. 2. Deviated septa. 3, 4. Œdematous tissue. 5. Hypertrophied tissue. 6. Nasal polypi. 7. Hypertrophied tissue peculiarly placed, but not necessarily occluding the nose. 8. Hypertrophied tissue exciting as well as mechanically pressing upon the Eustachian tubes. 9. Bands of tissue, seemingly cicatricial, stretching from the posterior wall of the pharynx to the Eustachian tube. 10. Atrophic or cicatricial rhinitis, with unusually patulous Eustachian tube. 11. Simple secretive catarrh. 12. Muco-purulent or hyperplastic catarrh. 13. Fibrous catarrh. 14. Ozænic catarrh, or catarrh with inspissated crusts.

Therapeutically the indications are: 1. To combat the blood dyscrasia. 2. To cure the catarrhally inflamed mucous membrane and restore its normal functions. 3. And if any thing the most important of them all, to free the nasal and naso-pharyngeal cavities from obstructions and encourage nasal breathing.

SWAN M. BURNETT.

48. It has been frequently discussed what part the ossicles play in the conduction of the sound waves through the tympanic cavity. A simple experiment shows that this part is a prominent one. If we sound a tuning-fork in front of a membrane, which is connected *e.g.* with the left ear, it is heard only on the left side, but if we then bring the membrane in contact with a solid body, which is connected with the right ear, it is perceived on the right side. From this simple proof it not only follows that the sound waves are better transmitted through solid bodies, as is taught by physics, but also that the ossicles play the most important part.

G. GELLÉ, Paris.

NERVOUS APPARATUS.

49. GRADENIGO, GUISEPPE, Padua. On the practical value of the electric examination of the acoustic nerve. *Allgem. Wiener med. Zeitung*, 1888, No. 44.

50. BAGINSKY, B. On Ménière's complex of symptoms. *Berliner klin. Wochenschrift*, 1888, No. 45.

51. MAGNAN and GELLÉ. Etiology of aural vertigo. *Soc. de Biologie*, April 7, 1888.

52. LANNOIS. Examination of two pretrous bones in a case of Ménière's complex of symptoms. *Soc. des scienc. méd. de Lyon*, 1888.

53. BURNETT, C. H. A case of aural vertigo (Ménière's disease) relieved by excision of the membrana tympani. *Trans. Amer. Otol. Soc.*, 1888.

54. BURNETT, C. H. Aural vertigo. *Medical News*, July 14, 1888.

55. BARATOUX, J. Changes in the internal ear in hereditary syphilis. *Trans. 9th Intern. Med. Cong.*, 1887.

49. GRADENIGO, with regard to the therapeutical value of galvanization in aural diseases, asserts that, even in apparently suitable cases (chronic processes of the inner and middle ear, otalgia, and continuous noises without objective and functional disturbances), he has never had results of any account and permanence, although electricity was employed in different persons for months every day. In the majority of cases of aural diseases Gradenigo produced temporary improvement. The galvanization is of much more importance for diagnosis and prognosis. Gradenigo thinks he may draw inferences from this as to the integrity of the

acoustic nerve or to the degree to which it is affected in the various morbid processes. It suffices in practice to determine the existence or absence of a reaction in medium intensity of the current.

50. From the fact that autopsies of cases of *intra vitam* intense vertiginous symptoms did not reveal any pathological changes in the semicircular canals and cochlea, and, on the other hand, revealed blood effusions into both cavities, where no vertiginous symptoms had existed, the author arrives at the conclusion that, in Ménière's vertigo, we have, in the greater part of cases, to deal with cerebral affections. Like his supposition that, according to his experiments, the cerebral lesion is in the physiological experiment the most important fact, ***he believes*** that foci of pus, inflammations, etc., at the bottom of the fourth ventricle, or in the course of their paths, injure the fibres of the acoustic and produce vertigo.

51. The authors found at the autopsy of a rabbit, which had suffered during life from aural vertigo, the external auditory meatus to be entirely obliterated. The middle ear was the seat of extensive suppuration with thickening of the mucous membrane by villous vegetations and osseous proliferations upon the walls. The stapes was immovably fixed in the oval window. Just as little as in the labyrinth were any changes found in the nervous centres. The symptoms observed during life were, therefore, produced by affections of the middle ear (*e. g.*, rotation of the neck, deviation from the position of the head, impossibility of changing the position without producing rotatory movements); for there was found no affection of the meninges which might be adduced in explanation. G. GELLÉ, Paris.

52. The patient, who suffered from an interstitial nephritis, offered during life the well characterized symptoms of Ménière's vertigo, with complete deafness. The petrous bones were first placed in osmic acid, then in a solution of chromic acid, and finally decalcified in a mixture of chromic and nitric acids. The small portion of the petrous bone presented an anchylosis of the anterior limb of the stapes in such a way as to allow the posterior part of the foot-plate of this bone to be easily pressed into the oval window, but not to allow in its entire circumference a movement outside the oval window, being firmly wedged in. There existed on the same side an additional distinct anchylosis of the ossicles and numerous fibrinous bands, extending from the capitulum of the malleus to the wall of the tympanic cavity. The set

of ossicles was also rigid in its whole extent. The cochlea under the microscope was found to be healthy, with the exception of the fibres of the lamina spiralis, which appeared somewhat rarefied after their exit. The left ear presented exactly the same changes, sclerosis of the middle ear, with absolute immobility of the chain of ossicles and anchylosis of the anterior stapedial portion with the margin of the oval window. The annular ligament was as hard as cartilage and the stapedial plate extremely thickened. The membrane at the oval window was hardened and appeared scarcely movable. In the labyrinth no noteworthy changes were found. This examination thus proves, in one case, that the symptoms of Ménière's vertigo are not always the result of an inflammation of the labyrinth, but that they may, on the contrary, be only associated with old purulent and sclerotic inflammations of the middle ear, and that the labyrinth may be only secondarily affected. G. GELLÉ, Paris.

53. BURNETT's case was in a woman, thirty-one years of age, who had lost much hearing power in the left ear in childhood from suppurative disease. Latterly there had developed a persistent high-pitched and annoying tinnitus, and still later a dizziness, for which she sought relief. Membr. tympani white, flattened, with the malleus adherent to the promontory, but otherwise free. Hearing 6 inches for the voice. The membr. tympani with the malleus and incus were removed in much the same manner as is done by Sexton under ether. The relief to the tinnitus and vertigo was immediate. There were no inflammatory reaction or other bad results. In course of time a new membr. tympani was formed. SWAN M. BURNETT.

54. In this paper, designed principally for the general practitioner, BURNETT considers the different ways in which Ménière's symptoms can be produced by affections in the external, middle or internal ear, the latter embracing the trunk of the nerve itself. He states that in one case of intense aural vertigo he got entire relief by Sexton's operation for removal of the malleus and incus. SWAN M. BURNETT.

55. BARATOUX in autopsies of hereditary syphilis in which the ears were affected, has found changes in the labyrinth alone in four cases. There was cellular proliferation of the membr. lam. basil., fibrinous clots in the vessels, and rupture of the walls. In all cases, in fact, there was present hemorrhage into some part of the labyrinth. SWAN M. BURNETT.

NOSE AND NASO-PHARYNX.

56. HOJECKI. The bacteria in acute and chronic coryza and in ozæna. *Berliner klin. Wochenschr.*, 1888, No. 33.

57. ROSSI, DE. Researches on the microörganisms in the Eustachian tube of healthy individuals. *Trans. 9th Inter. Med. Cong.*, 1887.

58. BISCHOFSWERDER. On primary rhinitis pseudo-membranacea. *Archiv f. Kinderheilk.*

59. LACOARRET, LÉONCE. Considérations cliniques sur le traitement du catarrh chronique des fosses nasales. Paris, 1888. Octave Doin.

60. BRONNER, ADOLF. The local treatment of empyema of the maxillary sinus. *Lancet*, August 25, 1888.

61. MCBRIDE, P. Empyema of the superior maxillary antrum, with only nasal symptoms. *Edinburgh Med. Jour.*, April, 1888.

62. SCHMIDT, MORITZ. Contribution to the diagnosis and treatment of the diseases of the antrum Highmori. *Berliner klin. Wochenschr.*, 1888, No. 50.

63. KRIEG, R., Stuttgart. Empyema of the antrum Highmori. *Med. Correspondenzblatt des Württemb. ärztl. Vereins*, 1888, No. 34.

64. LINK, IGNAZ, Lemberg. Clinical contributions to the operative treatment of empyema of the antrum Highmori, according to Prof. Mikulicz's method. *Wiener med. Wochenschr.*, 1888, No. 31.

65. HOPMANN, Cologne. Cure of a case of morbus Basedowii (Graves' disease) by improvement of a nasal affection. *Berliner klin. Wochenschr.*, 1888, No. 42.

66. BUCK, A. H. Reflex influences in the production of naso-pharyngeal catarrh. *Trans. Amer. Otol. Soc.*, 1888.

67. GRADLE, H. On headache from overlooked causes in the naso-pharynx and ears. *Jour. Amer. Med. Ass'n*, Sept. 8, 1888.

68. MOURE, E. I. Abcès aigu de la cloison des fosses nasales. *Revue mens. de laryngologie*, etc., 1888, No. 8.

69. MICHELSON, PAUL. On nasal syphilis. *Volkmann'sche Sammlung klinischer Vorträge*, No. 326.

70. McBRIDE, P. Methods of treating nasal and naso-pharyngeal polypi. *Edinburgh Med. Jour.*, Aug., 1888.

71. KIESSELBACH, Erlangen. On the presence of mucus in the nasal polypi. *Monatsschr. f. Ohrenheilk.*, 1888, No. 12.

72. KOEHLER, Posen. Two cases of rhino-scleroma. *Monatsschr. f. Ohrenheilk.*, 1888, No. 7.

73. JAKOWSKI, Warsaw. Second case of rhino-scleroma examined bacteriologically. *Gazeta Lekarska*, 1888, No. 27.

74. BRONNER, ADOLPH. Post-nasal growths and their relation to diseases of the middle ear. *Brit. Med. Jour.*, July 14, 1888.

75. WEIL, E., Stuttgart. On adenoid vegetations. *Württemb. med. Correspondenzbl.*, 1888, No. 37.

76. SCHAEFFER, Bremen. Bursa pharyngea and tonsilla pharyngea. *Monatsschr. f. Ohrenheilk.*, 1888, No. 8.

56. We find, according to HOJECKI's bacteriological examinations, very few bacteria (sarcina and a widespread diplococcus) in the normal nose. The more pus the discharged mucus contains and the longer the latter is retained in the nose, the larger is the amount and the number of the different kinds, especially where firmly adherent crusts have been formed. In acute coryza we find at first only one diplococcus of a large kind, which is soon overgrown and supplanted by from four to five different kinds, as, for instance, by Friedländer's pneumonia bacillus. In chronic rhinitis, also as a sequel to nasal stenosis, polypi, tumors, etc., the conditions are the same, only that staphylococcus pyogenes, and streptococcus of erysipelas are also found. In ozæna no specific infectious agent has been discovered up to date, in spite of the abundance of bacteria present in this condition. Only the microörganism which causes the peculiar fetor of ozæna has been determined and characterized as a bacillus extremely pernicious to mice and rabbits.

57. ROSSI obtained secretions from the Eustachian tubes of twelve healthy individuals, and found positive evidence of germs in six. In none were there found pathogenic organisms.

SWAN M. BURNETT.

58. BISCHOFSWERDER communicates several observations of croup of the nose, which agree with those published by Hartmann and Moldenhauer.

59. LACOARRET in his extensive monograph fully describes the various forms of chronic nasal catarrh. He distinguishes

three forms : simple coryza chronica, hypertrophic and atrophic coryza chronica. It is not within the scope of this review to enter into the details of the paper.

60. In four cases of empyema of Highmore's antrum treated by BRONNER the disease could be attributed in every one to a precedent nasal affection, and in none was the empyema caused by dental disease. Four histories of cases are communicated. Bronner arrives at the following conclusions : 1. The chronic empyema of the antrum is more frequent than is usually supposed. 2. In most cases no typical symptoms exist. 3. The empyema is the frequent cause of chronic and recurrent rhinitis, especially of the unilateral one. 4. The empyema may cause the typical symptoms of ozæna. 5. It is in most cases caused by diseases of the nasal mucous membrane and not by dental diseases. 6. The easiest and simplest method of treatment consists in opening the sinus from the nasal cavity, and not from the alveolar process.

61. MCBRIDE, in opposition to Bronner's views, believes that in by far the majority of cases dental caries should be considered as the cause of the empyema. McBride holds that injections from the middle nasal meatus are not advisable. He deems necessary a counter-opening in the alveolar process or one according to Mikulicz. Two cases treated by him are described.

62. SCHMIDT makes an exploratory puncture for diagnostic purposes by means of a hypodermic syringe between the lower turbinated body and the nasal floor. The canula is twice as long and thick as the ordinary needles, and the point is rounded off short. Of late he prefers a needle curved at the anterior end instead of a straight needle. When the puncture is successful the operation is made from the alveolar margin and offers nothing new.

63. KREIG has operated on 23 cases, viz., 21 from the processus alveolaris and 2 from the fossa canina ; 8 of these were men and 15 women between the ages of 17 and 55 years. The duration of the disease varied from two weeks to eleven years. The author uses for operation from the processus alveolaris a cock-saw drill, 3 *mm* wide, which supersedes the expensive apparatus proposed, *e. g.*, by Ziem. A solution of table-salt suffices for injection.

64. LINK's four cases, treated according to Mikulicz's method, do not excite special interest, with the exception of the concluding note, which reads as follows : If we place a cylindrical, smooth,

small piece of wood, of a finger's length, with one end upon the hard palate closely above the second molar tooth, and percuss on its free end with the finger, we hear from an empty antrum Highmori a full and clear sound, which becomes dull if we fill the antrum with water. Obstructing the corresponding nasal cavity has no influence upon the percussion note.

65. HOPMANN'S reported cure of Basedow's disease refers to a case which has been communicated before in the year 1885. It is of interest, inasmuch as in this case the reflex neurosis was produced by a nose affected with rhinitis atrophicans ; the turbinated bodies, being absent, could not have been the cause of it.

66. BUCK is of the opinion that inflammations of the naso-pharynx leading to aural troubles are due in not a few cases to irritation in the gastro-intestinal tract, and he has had one case of persistent naso-pharyngitis associated with tinnitus, which resisted all the usual remedies, and was relieved only on the successful treatment of retroverted uterus associated with subacute parametritis.

SWAN M. BURNETT.

67. GRADLE thinks that a certain type of continuous headache, more frequently met with in children, is due to the diminished patency of the Eustachian tubes. He has also found headaches with obstruction of the tubes. SWAN M. BURNETT.

68. MOURE'S patient was taken ill after a cold with the symptoms of an acute coryza with chills, intense fever, and frontal headaches. The external part of the nose was extremely inflamed, the swollen mucous membrane bulging out of the nostrils. Erysipelas was suspected. Permeability of the nose was restored after the effusion of fetid sanguineous pus. Whilst the mucous membrane was about to apply itself to the nasal septum, the dorsum of the nose sank. In spite of an apparatus introduced for its support, Moure did not succeed in restoring the former shape of the nose. He points out that the development of abscesses of the nasal septum by a cold has not been observed up to date, whilst those produced by a trauma are more frequently observed.

69. MICHELSON sketches, in the paper under consideration, the present knowledge of the pathology and therapeutics of nasal syphilis. He quotes only a statement of Mouriac on the frequency of the affection, according to which it amounts to about twenty per cent. of the tertiary affections. The author opposes his own statistics to the assertion that treatment with mercury

predisposes to tertiary symptoms, since in half of his cases a specific treatment had not previously been adopted. With regard to the period which elapses between the primary infection and the development of the nasal affection, the time from the first to the third year is considered most dangerous: one half of the cases falls within this period. The question as to the occurrence of a rhinitis in the so-called secondary stage is left open. In the chapter on the pathological anatomy Michelson confirms Moldenhauer's opinion that the saddle-shaped nose is principally caused by shrinking of the connective tissue between the membranous and cartilaginous portions of the nasal bones; rapid atrophy of previously swollen turbinated bodies is, according to Michelson, characteristic of gummous rhinitis and the direct result of rarefying ostitis. The author recommends, in order to strengthen the diagnosis, a histological and bacteriological examination, but considers the experimental use of specific remedies permissible. The shape of the ulcerations seems to him to be very important: he considers the furrowed ulcerations, which run in a sagital direction along the septum, plainly pathognomonic of its syphilitic character. Therapeutically, he recommends the combination of the local with the general treatment: with regard to the former the author inveighs principally against the reckless use of injections into the nose; he recommends, however, the use of tampons moistened with antiseptic solutions and of iodoform; with regard to the latter, he deems that in severe cases the combination of iodide of potassium with the inunction treatment or injections of calomel-oil, is indicated. Michelson, although not directly opposed to Volkmann's scraping with the sharp spoon, considers, with others, this operation as not entirely devoid of danger, its reaction frequently being violent, and would therefore like to see it used only as a last resort in malignant cases.

70. McBRIDE describes the operation for nasal and naso-pharyngeal polypi. He rejects the use of the forceps, and operates chiefly with the cold, and in some cases with the galvano-caustic, snare. Apart from the fibrous and malignant naso-pharygeal tumors, McBride distinguishes those extending from the posterior extremity of the middle turbinated body into the naso-pharynx and those springing from the margins of the choanæ. The latter cannot always be removed with the snare in which case the forceps or the galvano-cautery should be substituted.

71. KIESSELBACH reports that in his examinations he could

prove the presence of mucine in all nasal polypi. It is true that we do not find therein any special mucous tissue, but the presence of mucus is due to the swelling of mucine contained in all connective tissues, as is the case in congestion, especially in newly-formed connective tissue; indeed, the mucous membrane of the nose is frequently found œdematous in cases of formation of numerous polypi.

72. In the first of the cases, not very graphically described, the affection had existed twenty-seven years, and led to considérable enlargement of the nose (cp. illustration). The scleroma appears to have developed from an acne rosacea. In the last few years partial disintegration of the tumor had taken place. The second case, whose etiology could not be ascertained and which had existed two years, was cured with the flattened galvano-cautery. KOEHLER therefore "urgently" recommends the galvano-cautery. The first case was not operated upon; other remedies were without avail. In both cases the affection was confined to the exterior of the nose.

73. The patient, a woman twenty-five years of age, from Russian Poland, was treated in the surgical department under Prof. Jarodynski. Six years previously she had noticed a small tickling crust in the nose, which she had scratched away. Soon after some small tumors appeared in the same place, which gradually obstructed the corresponding nostril. Two years previously similar tumors appeared on the external parts of the nose. She was then operated on, and could subsequently breathe well through the nose. Several months later the trouble recurred, and led to the following changes: Both nostrils are filled with cartilaginous tumors, the right being completely obstructed, the left permeable to a very fine probe. On the right side the tumor extends to the upper lip; in either choana diffuse, hard infiltrations. (Reviewer had the opportunity of examining the patient, but could not discover the last-mentioned infiltrations.) The uvula is entirely absent. No further changes in the pharynx nor in the larynx. The tumors were removed with the knife, and the patient discharged. The bacteriological examination confirmed the clinical diagnosis: bacteria of rhinoscleroma were found. The author found the large cells described by Mikulicz to be missing in the specimens made from the secretion of the tumor, but he found them in small numbers in the sections and the hyaline bodies. Cultures were made in gelatine, agar-glycerine, and potatoes.

The pure cultures in agar-glycerine were injected in watery solution into the pleural cavity of four white mice with a negative result, the animals remaining healthy. The author, on account of these facts and his former views, reasserts that the bacteria of rhino-scleroma are not identical with Friedländer's bacilli, but show only a morphological similarity to them.

SREBERNY, Warsaw.

74. BRONNER discusses adenoid vegetations among 198 cases of diseases of the middle ear in children. He found 101, or more than 50 per cent., with adenoid vegetations. He removes the vegetations with Hartmann's curette. The advantages are: absence of pain, slight risk of injuring important parts, feasibility of operating without narcosis.

75. WEIL recommends Schütz' forceps for the removal of adenoid vegetations which in opposition to the ordinary instruments cuts in a sagittal direction.

76. SCHAEFFER states that the bursa pharyngea (viz.: what is meant as such by Luschka) is, according to Luschka himself and others, very rare, and occurs either congenitally as anatomical, or, according to Schwabach, as pathologico-anatomical abnormity. Among 6,000 nasal patients the author could diagnosticate the bursa pharyngea in 16. Its comparatively greater frequency, according to other authors, especially Tornwaldt, is explained as follows: In hypertrophy or defective involution of the tonsilla pharyngea, bridging of the longitudinal sulci, especially of the recessus medius of the tonsil, frequently takes place. The cavities thus formed, and some lacunæ of the pharyngeal tonsil (which, like those in the palatal tonsil, may lead to the formation of cysts), strikingly resemble a bursa in probing, particularly when the pharyngeal tonsil extends far down along the posterior wall of the pharynx. The author thinks, however, that for simplicity's sake the diseases of these cavities might be designated as bursitis. Moreover, he thinks from the frequent failure in their treatment that he is justified in concluding that the importance of this bursitis is much overvalued by Tornwaldt.

MISCELLANEOUS NOTES.

ADAM POLITZER, Vienna. Die anatomische u. physiologische Zergliederung der menschlichen Gehörorgans im normalen u. kranken Zustande. Stuttgart, Ferd. Enke. 1889.

By writing the above book: **the technique of dissecting the normal** and **pathological human ear,** the famous and indefatigable author has rendered an incalculable service to aural surgeons, anatomists, and physiologists. No part of the body is so difficult properly to investigate as the auditory organ; in none are the methods of examination so intricate, manifold, and laborious. Politzer's book of 245 pages, with 164 drawings in the text and one lithographic plate, is an excellent guide into all the details of anatomical aural investigation, describing and illustrating the appropriate instruments, the methods of removing the whole auditory organ from the dead body, with special directions for important points in morbid specimens. Then follow detailed descriptions of the dissection of the different parts of the ear, all possible sections to exhibit the topography of the ear and its neighboring parts, the methods of preservation of specimens, the anatomy of corrosion and the whole microscopic technique in detail, to decalcify, embed, cut, and mount specimens. That most difficult task, the histological investigation of the labyrinth, and the situation of the acoustic nerve and its roots and nuclei in the brain, are clearly described, yet not at a tiresome length. Any one desirous to make thorough investigations in the fundamental part of otology, will find in Politzer's book a reliable and complete guide. We should think that the work would be particularly welcome to our countrymen, the Americans, who have a natural predilection for what is positive in art and science, and who have not yet done much original work in this department.

H. KNAPP.

GHERARDO FERRERI. Indirizzo Pratico alla Diagnosi e Cura delle Malattie Nasali. Vallardi, Milan, 1889.

Dr. Ferreri's **Practical Guide to the Diagnosis and Treatment of the Diseases of the Nose,** Vol. xv. of Vallardi's Manuals, 337 small octavo pages, shows that in Italy as now everywhere, due attention is bestowed on nasal disease. The book is dedicated to the author's teacher, Prof. De Rossi, and chiefly destined for the use of students taking the first steps in this department. It presents the contents of rhinology in full, anatomy, physiology, rhinoscopy, etc., dwelling particularly on what is useful in practice. Rhinitis is described under the forms of acute, chronic, hypertrophic, atrophic, and infective. The nasal reflexes form a special chapter of twelve pages. Epistaxis, fractures, foreign bodies, tumors, adenoid vegetations, changes in the neighboring cavities, nasal syphilis, and some other subjects are fully described. The language is simple and clear. Foreign literature, specially the German, is extensively utilized. The book is surely what it promised to be, a practical guide, and it is a good one.

H. KNAPP.

CONTENTS OF VOLUME XVIII., NUMBERS 3 and 4.

1. Case of Cerebellar Abscess, Due to Ear-Disease, Successfully Operated upon by Dr. Wm. Macewen, Glasgow. Reported by Dr. Thos. Barr 217
2. Loss of Membrana Tympani, Malleus, Incus, and Stapes, with Good Hearing. By C. F. Clark, M.D., Columbus, Ohio . . 219
3. Contribution to the Physiology of the Soft Palate. By Otto Joachim, New Orleans, La. Translated by Arnold H. Knapp, A.B. . 226
4. Additional Botanical and Clinical Contributions to Otomycosis. By F. Siebenmann, Bâle. Translated by Dr. Max Toeplitz, New York. (With plate i. of vol. xix., German edition.) . . . 235
5. A Rare Case of Auditory Reflexes. By H. Steinbrügge, Giessen. Translated by J. B. McMahon, New York 274
6. Diseases of the Mastoid Process, with a Report of Cases. By Gorham Bacon, M.D., Aural Surgeon, N. Y. Eye and Ear Infirmary. (With four wood-cuts.) 280
7. The Improvement in Hearing Obtained by the Action of Intense Sounds in Cases of Ceruminal Plugs. By W. Kosegarten, of Kiel. Translated by Dr. J. M. Mills, of New York . . . 308
8. Investigations in Regard to the Influence of the Form of the Cranium upon Several Important Relations of the Temporal Bone. By Otto Körner, of Frankfurt-a.-M. Translated by Dr. J. M. Mills, of New York 310
9. On Atresia Auris Congenita. By Dr. Eugene Jöel, of Görbersdorf, Silesia. Translated by Dr. Felix Cohn, New York . . . 317
10. Miscellaneous Notes 325
11. Index 327

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b. Write without breaks, *i. e.* do not begin a new sentence on a new line. When you want to begin a new line or paragraph at a given word, place before it in your MS. the sign ¶.

c. Draw a line along the margin of such paragraphs as should be printed in smaller type—for instance, all that is clinical history in reports of cases, etc.

d. Words to be printed in *italics*, should be underscored once, in SMALL CAPITALS twice, in LARGE CAPITALS three times.

4. Authors may receive proofs for revision if they will kindly return them without delay. We beg however to remind our contributors that changes in the copy are equivalent to resetting, causing so much additional expense. We therefore request them, to make, if possible, no alterations at all in their MSS., or, at least, to limit these to what is of essential importance